King Fahd University of Petroleum and Minerals

Prep-Year Math Program

Math 001 - Term 171

Reading Mathematical Expressions & Arithmetic Operations

Expression	Reads	Note
$x \in A$	x belongs to A, x is in A	Between an element and a set.
$A \subset B$	A is a subset of B	Between two sets.
ϕ	The empty set	$\phi \neq \{\phi\}$
$A \cup B$	A union B	
$A \cap B$	A intersection B	
A'	The complement of A	
$a + b = c$	a plus b is equal to c	Addition; c is the sum
$a - b = c$	a minus b equals c	Subtraction; c is the difference
$a \cdot b = c$	a times b is equal to c	Multiplication; c is the product
$a \div b = c$	a divided by b equals c	Division; c is the quotient
$\frac{a}{b}$, a/b	a over b or a by b	Fraction , a : numerator b:denominator
$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$	one half, one third, one fourth	(Reciprocals of 2, 3 and 4)
$\frac{2}{3}, \frac{75}{102}$	five halves, two thirds , seven tenths	
a^b	a to the b, a to the b^{th} Power	a: base, b: exponent
a^2, a^3, a^{-1}	a squared, a cubed, a inverse	
$\sqrt[n]{a}$	The nth root of a	nth radical, a- radicand, n- index
$\sqrt{a}$, $\sqrt[3]{a}$	Square root of a , cube root of a	
$a < b$	a is less than b	Inequalities
$a \leq b$	a is less than or equal to b	
$a > b$	a is greater than b	
$a \geq b$	a is greater than or equal to b	

Question 1: Given $x = \frac{1}{9}$, $y = -5$ and $w = -\frac{5}{7}$ Find:

$\frac{x}{y} =$	$2x^2 =$	$(2x)^2 =$
$x - 5y =$	$x + y =$	$\frac{y}{x} =$
$y + \frac{x}{w} =$	$\frac{2}{x} - \frac{w}{2} =$	$\frac{x+w}{w-x} =$
$\frac{(y+x)(1-w)}{2w} =$	$2w - 3(3y - 2x) =$	$7\frac{1}{5} - 4\frac{1}{8} \div 1\frac{1}{4} =$

Question 2

Find

a- $1.32 + 0.132$
b- $1.05 - 100.3$
c- $(0.2)^2 - (0.07)^2$
d- $3 - (0.12)^2$
e- $26.06 \div 25$
f- $1.5 \div 0.15$
g- $12 \div 1.44$
h- $\frac{1.2 \times 1.04}{0.06}$

Question3

Answer the following:

1- Which is larger π or $\frac{22}{7}$, $(\pi \approx 3.14159)$
2- Which is smaller $\frac{7}{11}$ or $\frac{8}{13}$
3- Calculate and give the remainder of $2606 \div 25$
4- Express $\frac{115}{40}$ and $\frac{147}{28}$ in decimal form
5- Express 0.62 as a fraction in its lowest terms
6- Find the reciprocal of the mixed number $-2\frac{3}{5}$
7- $(a)\ \sqrt{1521} =$ $(b)\ \sqrt{30.25} =$ $(c)\ \sqrt{0.25 - 0.16} =$

Question4

Let a, b and c be real numbers with $a > 0$, $b < 0$ and $c < 0$.

Determine the sign of each expression

a- b^5 b- b^{10} c- ab^2c^3

d- $(b-a)^3$ e- $(b-a)^4$ f- $\frac{a^3c^3}{b^6c^6}$

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Recitation (P2)

Question1: $If\ A = \{x|\ x \leq -3\} \cup \{x|x > 1\}$, $B = \{x| -6 \leq x < 8\}$ and $C = \{x|1 \geq x > -1\}$ then find $(A \cap B) \cup C$.

Question2: Let a, b, c be real numbers such that $a > 0$, $b < 0$ and $c < 0$. Find the sign of each expression:

(a) $-b$ (b) $a - c$ (c) $ab + ac$ (d) ab^2

Question3: Given the sets

A = $\{-4, -2,\ 0,\ 4,\ 6,\ 8,\ 9\}$

B = {y | y is an even prime number}

C = {y | y is a composite number < 9}

Then $A \cup (B \cap C) =$

(a) $A \cup B$ (b) $B \cap C$ (c) C (d) A (e) $\emptyset$

Question4: Which one of the following statements is TRUE?

(a) Every rational number has a multiplicative inverse
(b) Every irrational number is not real number
(c) Every even integer has an additive inverse
(d) $\pi = \frac{22}{7}$
(e) The sum of two rational numbers is always irrational

Question 5: Which one of the following statements is TRUE?

(a) The sum of two irrational numbers is always irrational.
(b) The distance between a and b is the same as the distance between b and a.
(c) If x is any integer and y is any irrational number, then x/y is irrational.
(d) The distributive law states that $a \div (b + c) = (a \div b) + (a \div c)$
(e) Any irrational number has a terminating or repeating decimal expansion.

Question 6: Given $\frac{1}{3} \leq x < \frac{2}{3}$, the expression $\left|x - \frac{2}{3}\right| - \left|\frac{1}{4} - x\right|$ can be written without the absolute value symbols as:

(a) $-\frac{11}{12}$ (b) $2x - \frac{11}{12}$ (c) $\frac{11}{12} - 2x$ (d) $-\frac{5}{12}$ (e) $\frac{5}{12}$

Question 7: If $If\ A = (-\infty, -1) \cup [2, \infty)$ and $B = (-2, 3]$, then find $A \cap B$.

Question 8: The expression $\left[-2 + \frac{11}{5} + \left(-\frac{11}{5}\right)\right] \div \left(\frac{1}{3} - \frac{1}{4}\right) - \left(\frac{-3^2}{4}\right) + 2$ simplifies to:

(a) $-\frac{79}{4}$
(b) $\frac{7}{3}$
(c) $-\frac{97}{4}$
(d) $\frac{49}{12}$
(e) $-\frac{5}{12}$

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Recitation (P.3)

Question1: In scientific notation 8,300,000 is _____ and 0.0000327 is_____.

Question2: Simplify the expression with exponents $\left(\frac{2a^{-1}}{b^{-2}}\right)^{-3}\left(\frac{2y^{-3}}{x^{2}}\right)^{3}$

Question3: The expression $\left(\frac{xy^{-2}z^{-3}}{x^{2}y^{3}z^{-4}}\right)^{-3}$ is equal to

$(a)\ \frac{x^3y^{15}}{z^3}$ $(b)\ \frac{x^3y^3}{z^3}$ $(c)\ \frac{z^3y^{15}}{x^9}$ $(d)\ \frac{x^9y^3}{z^6}$ $(e)\ \frac{z}{xy}$

Question4: Which one of the following statements is TRUE?

$(a)\ \left(\frac{2}{3}\right)^{-2} = \frac{3}{4}$

$(b)\ (-5)^4 = -5^4$

$(c)\ (x^2)^3 = x^5$

$(d)\ (2x^4)^3 = 2x^{12}$

$(e)\ \left(\frac{1}{2}\right)^{-1} = \frac{1}{2^{-1}}$

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Recitation (P.4)

Question1: Simplify the expression $\left(\frac{-27}{8}\right)^{\frac{-2}{3}} - (2)^{\frac{1}{6}}(-32^{\frac{1}{6}}) + 3(-2)^0$

Question2: Simplify the expression:

$\left(\frac{x^{1/2}y^2}{2y^{1/4}}\right)^4 \left(\frac{4x^{-2}y^{-4}}{y^2}\right)^{1/2}$, where $x > 0 \ \ and \ \ y > 0$

Question3: If $x = 1, y = 4, \text{ and } z = 32$, then the value of the expression $\left(\frac{x^{-2/3}}{y^{1/2}}\right)\left(\frac{x^{-2}}{y^{-3}}\right)^{1/6} + z^{2/5}$ is

(a) -1 (b) -3 (c) 5 (d) -5 (e) 3

Question4: If $x < -3$, then simplify and write the expression $\sqrt{(-7)^2} - \sqrt{(3x+7)^2} + \sqrt[3]{(-7)^3}$ without absolute value symbols.

Question5: Simplify the expression $\frac{\sqrt[3]{a^6b^8}}{ab^3} - \frac{a}{\sqrt[6]{b^2}}$

Question6: Simplify the expression $-3xy\sqrt[4]{32x^5y^6} + 2x^2\sqrt[4]{2^9xy^{10}}$

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Recitation (P.5)

Question1: If the coefficient of x^3 in the product $x^2\left(kx-\frac{2}{k}\right)\left(5x+\frac{1}{k}\right)$ is $-\frac{7}{3}$, then k is equal to

(a) -3 (b) $-\frac{30}{4}$ (c) 3 (d) $\sqrt{\frac{6}{7}}$ (e) $-\sqrt{\frac{6}{7}}$

Question2: Which one of the following is a polynomial of degree 2?

(a) $x^2+\frac{2}{x}+x+1$

(b) $x^2+x^{3/2}+\sqrt{2}$

(c) $(3x+2)^3+\sqrt{2}x^2-27x^3$

(d) $\frac{x}{x^3-1}$

(e) $x^2+x+1+\sqrt{x}$

Question 3: If $X=(a-2b)^3$ and $Y=(2a+b)^3$, then $X-Y=$

Question 4: Perform the following indicated operations, and simplify:

$(a)\ \left(c+\frac{1}{c}\right)^2$ $(b)\ \left(\sqrt{h^2+1}+1\right)\left(\sqrt{h^2+1}-1\right)$

$(c)\ (x+y+z)(x-y-z)$ $(d)\ a^x(a^x-4)(a^x+1)-(a^x-1)^3$

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Recitation (P.6)

Question 1: Factor each polynomial.

(a) $\left(1+\frac{1}{x}\right)^2-\left(1-\frac{1}{x}\right)^2$
(b) y^3-1-y^2+y
(c) $2(a+b)^2+5(a+b)-3$
(d) $8r^3-64t^6$

(e) $\frac{1}{2}x^{-1/2}(3x+4)^{1/2}+\frac{3}{2}x^{1/2}(3x+4)^{-1/2}$

Question 2: One of the factors of x^4+x^2-2 is

(a) $x-1$
(b) $2x+1$
(c) $2x^2+1$
(d) $x+\sqrt{2}$
(e) $x-\sqrt{2}$

Question 3: The possible value(s) of k that make(s) the trinomial $36x^2+kxy+49y^2$ a perfect square is (are)

(a) 84 (b) -84 (c) ± 84 (d) ± 42 (e) -42

Question 4: One of the factors of $4x^2-8xy-5y^2-4x+10y$

(a) $2x+y-2$

(b) $4x-4y-2$

(c) $2x+y$

(d) $2x-y+2$

(e) $5x-2y$

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Recitation (P.7)

Question 1: Simplify the following rational expressions

(a) $\frac{2}{4+x}+\frac{16}{x^2-16}+\frac{6}{4-x}$ (b) $\frac{4}{2-x}+\frac{5}{x^2+2x+4}\div\frac{x^2-4x+4}{x^3-8}$

Question 2: Simplify the following expressions

(a) $\frac{x+\frac{1}{x+2}}{x-\frac{1}{x+2}}$ (b) $1+\frac{1}{1+\frac{1}{1+x}}$

Question 3: The expression $\frac{\frac{2x^2-3x-2}{x^2-1}}{\frac{2x^2+5x+2}{x^2+x-2}}$ simplifies to:

(a) $\frac{x+1}{x-2}$ (b) $\frac{x-2}{x+1}$ (c) $\frac{2x+1}{x+2}$ (d) $\frac{x+2}{2x+1}$ (e) $\frac{x+2}{x-1}$

Question 4: The least common denominator (LCD) of the expression

$\frac{1}{x^3-1}+\frac{3}{14(x-1)^3}-\frac{5}{24(x^3+x^2+x)}$ is

(a) $2x(x-1)^3(x^2+x+1)$

(b) $168x(x-1)^3(x^2+x+1)$

(c) $2(x-1)^3(x+1)^3$

(d) $168(x-1)^3(x+1)^3$

(e) $2(x+1)^3(x^3-1)$

Question 5: Rationalize the denominator of $\frac{2x-2y}{\sqrt{x}-\sqrt{y}}$

Question 6: Find the domain of (a) $\frac{\sqrt{x}}{x^2-3x-4}$ (b) $\frac{x^2-1}{x^2-x-2}$

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Recitation (P.8)

Question 1: $If\ x = \frac{5}{12}$ is a solution of the equation $\frac{x}{5} - \frac{3}{2} = \frac{4x}{5} - \frac{\boldsymbol{a}}{4}$

then $\boldsymbol{a}$ is equal to:

(a) -7 (b) $-\frac{1}{7}$ (c) $\frac{1}{7}$ (d) 7 (e) $\frac{7}{4}$

Question 2: Solve the equations for *k*.

$(a)\ -k = (5k+3)(3x+1)$

$(b)\ \frac{k+1}{b} = \frac{k-1}{b} + \frac{b+1}{K}$

Question 3: Solve the given equation.

$(a)\ 3x - \frac{5x}{2} = \frac{x+1}{3} - \frac{1}{6}$

$(b)\ \frac{1}{x} - \frac{2}{2x+1} = \frac{1}{2x^2+x}$

$(c)\ \frac{3}{x+4} = \frac{1}{x} + \frac{6x+12}{x^2+4x}$

Question 4: Find all real solutions of the following equation.

$(a)\ 6x^{2/3} - 216 = 0$

$(b)\ (x+2)^4 - 81 = 0$

$(c)\ (3x-4)^2 - 7 = 0$

$(d)\ \frac{x+1}{x-1} = \frac{3x}{3x-6}$

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Recitation (1.1)

Question 1: Find a point on the y-axis that is equidistant from the points $(5,-5)\ and\ \ (1,1)$

Question 2: Find the distance between the points $P(2x,-7x)$ and $Q(-2x,-4x)$ where $x<0$.

Question 3: If the point $(1,\ 4)$ is 5 units from the midpoint of the line segment joining $(3,-2)$ and $(x,\ 4)$, then x is equal to

(a) either $7\ or\ -9$

(b) -15

(c) either $4+3\sqrt{11}\ \ or\ \ 4-3\sqrt{11}$

(d) either $-7\ or\ 9$

(e) 15

Question 4: If $M(6,8)$ is the midpoint of the line segment AB and if A has coordinates $(2,3)$ then the coordinates of B is

$(a)\ \left(4,\frac{11}{2}\right)$ $(b)\ (16,25)$ $(c)\ (10,13)$ $(d)\ (13,10)$ $(e)\ (4,5)$

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Recitation (1.2)

Question 1: Sketch the graph of the following equations:

(a) $x = \sqrt{y-1}$ (b) $y = |4-x|$ (c) $y = x^2 + 1$ (d) $y = \sqrt{9-x^2}$

Question 2: Find the general form of the equation of a circle with center at (-3, 5) and tangent to the y-axis.

Question 3: If $x^2 + y^2 - 4y = 5 - k^2$ is the equation of a circle which is tangent to the x-axis, then $k =$

$(a) \pm\sqrt{5}$ $(b)\ 0$ $(c)\ \pm 2$ $(d) \pm 5$ $(e)\ \pm 1$

Question 4: Find an equation of the circle that has the points $P(-1, 1)$ and $Q(5,\ 9)$ as the endpoints of a diameter.

Question 5: Let **M** be the midpoint of the line whose endpoints are $(1, -2)\ and (-3,\ 6)$, and let **C** be the center of the circle $x^2 + 4x + y^2 - 8y + 2 = 0$. Then, find the distance between **M** and **C.**

Question 6: Which one of the following statements is TRUE?

(a) $y^2 = |x+1| - 3x^2$ is symmetric with respect to the origin.
(b) $x^2 = |x-y|$ is symmetric with respect to the x – axis.

(c) $|y| = \frac{|x+2|}{x^2}$ is symmetric with respect to the y – axis.

(d) $|xy| + |x|y = 1$ is symmetric with respect to both the x-axis and the origin.

(e) $x^4y^4 + x^2y^2 = 1$ is symmetric with respect to x – axis, y-axis, and the origin .

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Recitation (1.3)

Question 1: If $A(-1,2),\ B(-10,5),\ and\ C(-4,\ k)$ are the vertices of a right triangle, where the right angle is at B, then find the value of k.

Question 2: Find k so that the line passing through $(-2,-11)$ and $(k,\ 2)$ is perpendicular to the line passing through $(1,1)\ and\ (5,-1)$

Question 3: The equation of the line passing through (4, 1) and parallel to $x = 5$ is

$(a)\ x = 5$ $(b)\ y = 1$ $(c)\ x = 1$ $(d)\ x = 4$ $(e)\ 4x + y = -5$

Question 4: The line with x-intercept $\frac{1}{4}$ and y-intercept $-\frac{1}{2}$ intersects the line $y = 2$ at the point $(p,\ q)$. The value of p is

(a) $\frac{5}{4}$ (b) 1 (c) $-\frac{5}{2}$ (d) $\frac{1}{2}$ (e) $\frac{3}{4}$

Question 5: Find an equation for the line tangent to the circle $x^2 + y^2 = 25$ at the point $(3,-4)$

Question 6: A point that lies on the line that is perpendicular to the line $3y - 2x + 6 = 0$ and passes through the point $(2,\ 3)$ is

(a) $(-2,\ 1)$ (b) $(1,\ 5)$ (c) $(4,\ 3)$ (d) $(6,-5)$ (e) $(3,\ \frac{3}{2})$

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Recitation (1.4)

Question 1: For the given equation $\sqrt{7}x^2 + 6x - \sqrt{7} = 0$, state the number of distinct solutions, and whether they are rational, irrational, or non-real complex.

Question 2: The product of all the solutions of the equation $\frac{1}{r} + \frac{2}{1-r} = \frac{4}{r^2}$ is

$(a)\ 16$ $(b)\ 4$ $(c)\ -4$ $(d)\ 25$ $(e)\ 9$

Question 3: When completing the square in the equation $4x(x-2) = -7$, we get $(x+a)^2 = b\ , then\ \ a + b^2 =$

$(a)\ \frac{25}{16}$ $(b)\ 1 + \frac{\sqrt{3}}{2}i$ $(c)\ 1 - \frac{\sqrt{3}}{2}i$ $(d)\ -\frac{7}{16}$ $(e)\ 0$

Question 4: If the quadratic equation $kx^2 = kx - 16$ has a double solution (two equal solutions), then k =

$(a)\ 0\ and\ 64$ (b) 0 (c) 64 (d) 16 (e) 0 and 16

Question 5:

(a) If a quadratic equation $\boldsymbol{a(x+3)^2 + 2 = 0}$ has a solution $x = -4$, then find the other solution of the equation.

(b) If the sum and the product of the two roots of the equation

$0.9x^2 + bx + c = 0$ are $\frac{4}{3}$ and 1 respectively, then find the values of $b\ and\ c$.

(c) For the equation $9x^2 - 1 - 4xy = 3y^2$, solve for y in terms of x.

(d) Find two numbers whose sum is 55 and whose product is 684.

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Recitation (1.5)

Question 1: The sum of the real part and the imaginary part of the complex number $\frac{\sqrt{-4}(\sqrt[3]{-27}-\sqrt{-16})}{(1+i)^2}$ is equal to

(a) -11
(b) -7
(c) -1
(d) 11
(e) $4i$

Question 2: If $\frac{(\sqrt[3]{-125}\,i-\sqrt{-25}\sqrt{-1}\,)}{(2i-1)(2i+1)i^{103}} = x + iy,$ then $y - x$ =

Question 3: If $Z = \left(\frac{2+i}{1-i}\right)^2 + \left(\frac{1+i}{1-i}\right)^{21}$, then find $\bar{Z}$.

Question 4: If $i = \sqrt{-1},$ then the expression $\frac{3i^{90}-9i^{92}}{2i^{89}-4i^{91}}$ simplifies to:

(a) $2i$ (b) i (c) $-i$ (d) $\frac{1}{2}i$ (e) $-\frac{1}{2}i$

Question 5: If $Z = -i$, then find the value of $2Z^{98} + 2Z^{99} + 2Z^{100} + 1$.

Question 6: Find the reciprocal of the complex number

$\left(\sqrt[3]{-27} + \sqrt{-9}\right)i + \sqrt{(-5)^2}$.

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Recitation (1.6)

Question 1: Solve the following equation:

(a) $x^4 - 5x^2 + 6 = 0$
(b) $\frac{-4x}{x-1} + \frac{4}{x+1} = \frac{-8}{x^2-1}$
(c) $\left(\frac{x}{x+2}\right)^2 = \frac{4x}{x+2} - 4$

Question 2: Find the sum of all solutions of the following equation:

(a) $\sqrt{x+2} = 1 - \sqrt{3x+7}$
(b) $x - \sqrt{x} = 12$
(c) $\frac{10}{x-5} + x = 1 - \frac{2x}{5-x}$

Question 3: Find the solution set of the equation $\sqrt{2x} = \sqrt{x+7} - 1$

Question 4: The solution set of the equation $(2x-1)^{\frac{2}{3}} - 2(2x-1)^{\frac{1}{3}} - 3 = 0$ is

$(a)\ \{-13, 1\}$ (b) $\{-12\}$ (c) $\{2\}$ (d) $\emptyset$ (e) $\{0, 14\}$

Question 5: The solution set of the equation $7x^{-2} + 19x^{-1} = 6$ is

(a) $\left\{\frac{7}{2}, -\frac{1}{3}\right\}$ (b) $\left\{\frac{2}{7}, -3\right\}$ (c) $\left\{-\frac{7}{2}, -\frac{1}{3}\right\}$ (d) $\left\{\frac{7}{2}, 3\right\}$ (e) $\left\{-\frac{7}{2}, \frac{1}{3}\right\}$

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Recitation (1.7)

Question 1: Find the solution set of the following inequalities:

(a) $-\frac{1}{2} \leq \frac{4-3x}{5} \leq \frac{1}{4}$

(b) $4x^2 + 3x \leq 1$

(c) $\frac{(x-8)^8}{x^2+7x+12} \leq 0$

Question 2: The solution set of the inequality $0 < x^2 - 4 \leq 5$ is

(a) $(-3, -2] \cup (2,\ 3]$

(b) $(-3,\ 3]$

(c) $(-3,\ 3)$

(d) $[-3, -2) \cup (2,\ 3]$

(e) $(-3,\ -2]$

Question 3: If the solution set of the inequality $x(5x + 3) \leq 3x^2 + 2$, is given by the interval $[\mathbf{m}, \mathbf{n}]$, then calculate $\mathbf{m} - \mathbf{n}$.

Question 4: Determine the values of the variable for which the expression is defined as a real number.

(a) $\sqrt{16 - 9x^2}$ (b) $\sqrt[4]{\frac{1-x}{2-X}}$ (c) $\sqrt{\frac{1}{x^2-5x-14}}$

Question 5: Solve the following nonlinear inequality and express the solution set in interval notation.

$$\frac{x}{2} \geq \frac{5}{x+1} + 4$$

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Recitation (1.8)

Question 1: If A is the solution set of $\frac{x^2+14x+49}{x^2+x-12} \leq 0$

and B is the solution set of $3 \leq |x| \leq 7,\ then\ A \cap B =$

(a) $[-7, 7)$

(b) $(-4,\ 3)$

(c) $\{-7\} \cup (-4, 3) \cup (3,\ 7)$

(d) $(-4, -3) \cup \{-7\}$

(e) $(-7, -3) \cup (3,\ 7)$

Question 2: Find the sum of all solutions of $3|2-x|^2 - 7|x-2| = 6$.

Question 3: If $|x-5| < \frac{1}{2}$ is equivalent to $m < 2x - 3 < n$, then the values of $m\ and\ n$ are

(a) $-1, 1$ (b) $-\frac{1}{2}, \frac{1}{2}$ (c) $6,\ 8$ (d) $3,\ 4$ (e) $9,\ 11$

Question 4: Solve the following:

(a) $|x+3| = |2x+1|$

(b) $\left|\frac{5}{3} - \frac{1}{2}x\right| + \frac{1}{3} > \frac{5}{9}$

(c) $\left|\frac{3x+2}{x}\right| < 1$

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Recitation (2.1)

Question 1: Find the domain of the following function:

(a) $f(x) = \sqrt{7 - 3x}$

(b) $f(x) = \sqrt{|x - 5|}$

(c) $f(x) = \frac{x^4}{x^2+x-6}$

(d) $f(x) = \sqrt{x^2 - 2x - 8}$

(e) $f(x) = \frac{x^2}{\sqrt{6-x}}$

Question 2: The domain of the function $y = \frac{\sqrt{x+1}}{x}$ is

(a) $(-1, 0) \cup (0, \infty)$ (b) $[-1, \infty)$ (c) $[-1, 0) \cup (0, \infty)$ (d) $[1, \infty)$ (e) $[0, \infty)$

Question 3: Find the domain and the range of the following function:

(a) $f(x) = 5x^2 + 4,\ 0 \le x \le 2$

(b) $f(x) = -x - 3$

(c) $f(x) = 1$

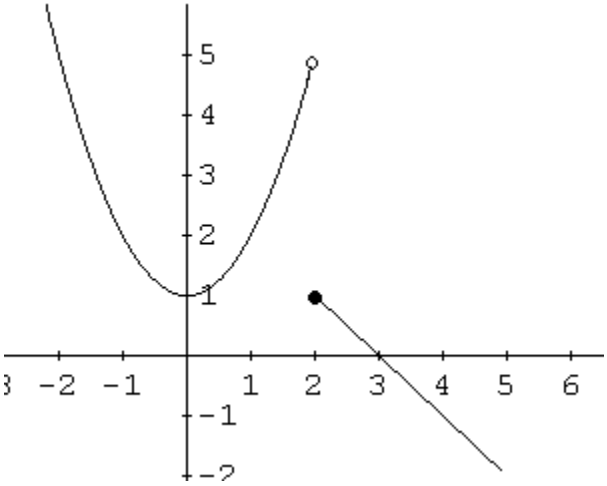
Question 4: If $f(x) = \frac{2x}{x-1}$, then find the difference of quotient $\frac{f(a+h)-f(a)}{h}$,

where $h \neq 0$

Question 5: If $f(x) = \begin{cases} x^2 + 2x & if\ x \le -1 \\ x & if -1 < x \le 1 \\ -1 & if\ x > 1 \end{cases}$ then evaluate $f(-5)$, $f\left(\frac{1}{2}\right)$ and $f(2)$.

King Fahd University of Petroleum and Minerals
Prep-Year Math Program
Math (001) - Term 171
Recitation (2.2 &2.3)

Question 1: Which one is TRUE about the graph of the following function?



The function is

(a) increasing on $[0, 2)$ and decreasing on $(-\infty, \infty)$.

(b) increasing on $[0, 2)$ and decreasing on $(-\infty, 0) \cup (0, \infty)$.

(c) increasing on $(-\infty, \ 0] \cup [2, \infty)$ and decreasing on $[0, 2)$.

(d) increasing on $(-\infty, 0) \cup (2, \infty)$ and decreasing on $[0, 2)$.

(e) increasing on $[0, 2)$ and decreasing on $(-\infty, 0] \cup [2, \infty)$.

Question2: The equation that defines y as a function of x is

(a) $x^2 - y^2 = 0$
(b) $x - |y| = -5$
(c) $y = \pm 4$
(d) $y = \sqrt[3]{x + 4}$
(e) $(x - 5)^2 = 25 - (y - 3)^2$

Question3: Find the domain and the range of the following functions

(a) $y = -\sqrt{25 - x^2}$

(b) $y = \frac{x}{|x|}$

(c) $y = -|x - 3| - 3$

(d) $|x| - x$

Question4: The range of the function $f(x) = \begin{cases} |x| + 1 & if \ x < 1 \\ -x^2 - 1 & if \ 1 \leq x < 2 \\ 3 & if \ x \geq 2 \end{cases}$

(a) $(-\infty, -2] \cup [1, \infty)$

(b) $(-5, -2] \cup [1, \infty)$

(c) $(-5, -2] \cup [1, 2) \cup (2, \infty)$

(d) $(-\infty, -1] \cup [1, \infty)$

(e) $(-5, -1] \cup (3, \infty)$

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Math (001) - Term 171
Recitation (2.5)

Question 1: Determine which function is linear

(a) $f(x) = \frac{2x-3}{x}$

(b) $f(x) = \sqrt{x} - 1$

(c) $f(x) = (x+1)^2$

(d) $f(x) = \frac{1}{3}x + \frac{2}{3}$

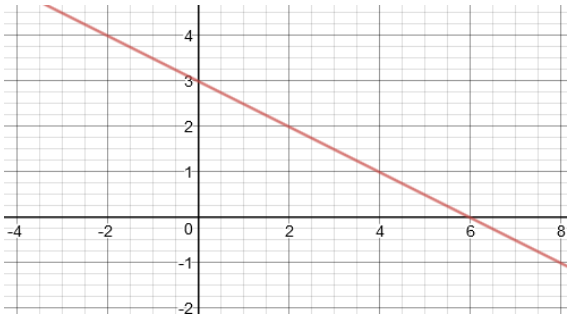
(e) $f(x) = x(4-x)$

Question2: Sketch the Graph and find the slope of the following linear functions

(a) $f(r) = \frac{2}{3}r - 1$

(b) $f(t) = 0.5\,t - 2$

Question3: From the graph, find the rate of the change of the linear function and express it in the form of $f(r) = ax + b$ (The slope y-intercept form)



Question4: The difference between 5 times a number and 8 is equal 7 times the sum of the number and 3. Find the number.

Question 5: If the length of each side of the original square is decreased by 4 inches, the perimeter of the new square is 10 inches more than half the perimeter of the original square. What are the dimensions of the original square?

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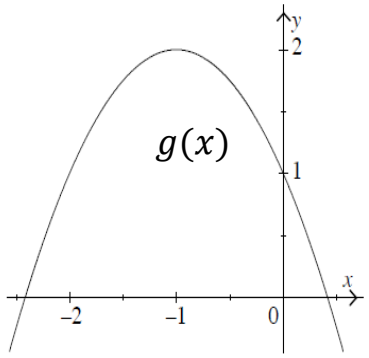
Recitation (2.6)

Question1: If the graph of the function $y = g(x)$ below is obtained from the graph of $f(x) = x^2$, then which one of following equations is TRUE about the graph of g.



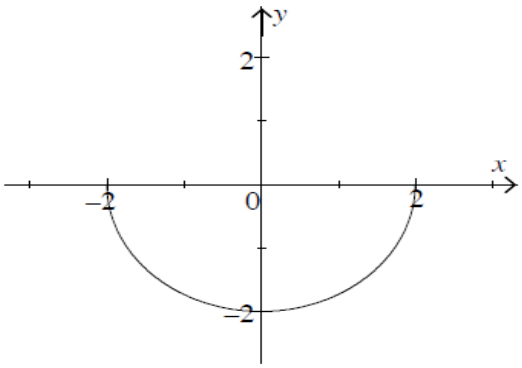
(a) $g(x) = -f(x+1) + 2$
(b) $g(x) = -f(x+1) + 1$
(c) $g(x) = f(x-1) + 2$
(d) $g(x) = -f(x-1) + 2$
(e) $g(x) = f(x+1) + 1$

Question2:

(1) Describe how the graph of $y = -2\sqrt{x+2} - 3$ can be obtained from the graph of $y = \sqrt{x-2} + 2$.
(2) If the graph of $g(x) = |x|$ is translated three units down, five units left, and reflected across the x-axis, then write the new equation.
(3) If the graph of $g(x) = x^2 - 2x + 1$ is reflected across the y-axis, translated two units right, one unit down, and reflected across the x-axis, then write the new equation.

Question3: If $f(-4) = 2$, then find the coordinates of the point that lie on the graph of $g(x) = -2f(-x-1) - 2$.

Question4: If the figure below is the graph of $y = f(x)$, then find the domain D and the range R of the function $g(x) = -\frac{1}{2} f\left(\frac{x}{2}\right)$.



Question5: Which one of the following statements is TRUE?

(a) $f(x) = x + \frac{1}{x}$ is an even function.

(b) $f(x) = 1 - \sqrt[3]{x}$ is neither even nor odd.

(c) $f(x) = 3x^3 + 2x^2 + 1$ is an odd function.

(d) $f(x) = 2x^2 - 3|x|^5 + 5$ is an even function.

(e) $f(x) = \frac{\sqrt{4x - x^3}}{x^7 + 1}$ is an odd function.

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Math (001) - Term 171
Recitation (2.7)

Question1: Given $F(x) = \sqrt{1+\sqrt{x}}$, find functions f and g such that $F = fog$.

Question2: If $f(x) = x + k$, $g(x) = [\![x]\!]$ and the graph of the function $(gof)(x)$ has y-intercept = 3, then find all the values of k.

Question3: If $f(x) = x + 4$ and $(f \circ g)(x) = 12 + 8x + 2x^2$, then $g(2) =$

(a) 4 (b) 6 (c) 36 (d) 40 (e) 32

Question4: If $f(x) = \begin{cases} [\![1 - \frac{x}{3}]\!] & if\ x \le -3 \\ 1 & if -3 < x < 0 \\ x^2 + 1 & if\ x \ge 0 \end{cases}$ and $g(x) = |1 + x|$.

Then the value of $(f \circ f)\left(-\frac{7}{2}\right) + \left(\frac{f}{g}\right)\left(-\frac{7}{2}\right) =$

(a) $\frac{29}{5}$ (b) $\frac{26}{5}$ (c) $\frac{4}{5}$ (d) $\frac{39}{7}$ (e) $\frac{15}{2}$

Question5:

(a) If $f(x) = \sqrt{9 - x^2}$ and $g(x) = x^2 - 2x - 8$, then find the domain of $\left(\frac{f}{g}\right)(x)$.

(b) Find the domain of $(f \circ g)(x)$, where $f(x) = \frac{x-1}{3-x}$ and $g(x) = \sqrt{x+2}$.

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Math (001) - Term 171
Recitation (3.1)

Question1: For the quadratic functions below:

(a) $f(x) = -\frac{1}{2}(x+1)^2 - 3$ (b) $f(x) = \frac{2}{3}x^2 - \frac{8}{3}x + \frac{5}{3}$

Find

(a) axis of symmetry
(b) vertex
(c) domain and range
(d) minimum or maximum value
(e) x-intercept and y-intercept
(f) interval where the function is increasing and decreasing
(g) interval where the function is above x-axis and below x-axis

Question2: The sum of the real coefficients 'a', 'b', 'c' of the quadratic function $f(x) = ax^2 + bx + c$ that has only one x-intercept at -2 and y-intercept at 8 is

(a) 2 (b) 16 (c) 18 (d) 8 (e) -21

Question3: If -3 is a zero of the quadratic function $f(x) = ax^2 + bx + c$ and its graph has lowest point $(-2, -2)$. What is the other zero of this quadratic function?

Question4: If a ball is thrown up in the air and its height h, in meters, is a function of time t, in seconds, given by $h(t) = -16t^2 + 128t + 105$, then the time it will take the ball to reach its maximum height is

(a) 4 seconds
(b) 8 seconds
(c) 2 seconds
(d) 1 second
(e) 16 seconds

Question5: If $x = -3$ is the axis of symmetry of the parabola

$f(x) = -2x^2 - 4cx - c^2 - 7$ for some constant c, then the maximum value of $f(x)$ is equal to

(a) 3 (b) 1 (c) -3 (d) No maximum value (e) 2

Question6: If the slope of the line passing through $(2, -3)$ and the vertex of the parabola $y = (x + m)^2 - 5$ is $\frac{3}{m}$, then the parabola is increasing in the interval

(a) $(-6, \infty)$

(b) $(-\infty, -6)$

(c) $(6, \infty)$

(d) $(-5, \infty)$

(e) $(-\infty, 5)$

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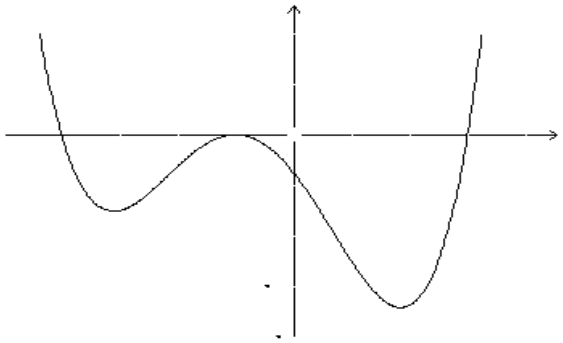
Math (001) - Term 171
Recitation (3.2)

Question1: If $f(x) = a(x+4)(x^2+2x+1)(3-x)$ has the graph below then a reasonable possible value of the leading coefficient a that will justify the end behavior (Far left and Far right behavior) of the graph is



(a) $a = -1$

(b) $a = 2$

(c) $a = 0$

(d) $a = 1$

(e) $a = {}^{1}/_{2}$

Question2: Which one of the following statements is TRUE about the graph of the polynomial function $f(x) = x^4 + 3x^3 - 9x^2 - 23x - 12$?

(a) up to the left and down to right with at most 3 turning points.

(b) down to left and down to right with at most 1 turning point.

(c) up to left and up to right with at most 3 turning points.

(d) down to left and up to right with at most 4 turning points.

(e) up to left and up to right with at most 4 turning points.

Question3: Which one of the following polynomials has the graph given below?

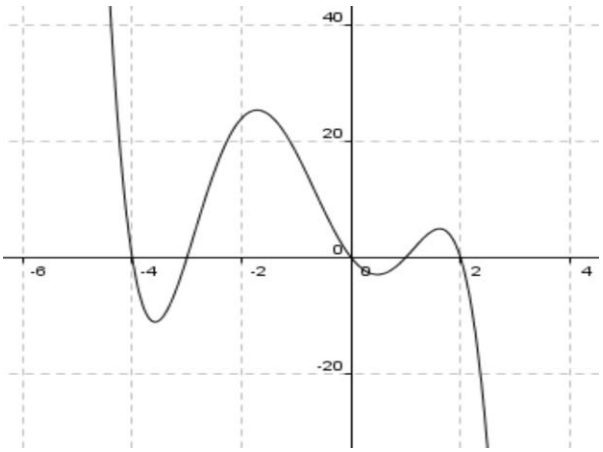
(a) $P(x) = \frac{1}{2}x(x-1)(x-2)(x+3)(x+4)$

(b) $P(x) = -\frac{1}{2}x(x-1)(x-2)(x+3)(x+4)$

(c) $P(x) = -\frac{1}{2}x(x-1)(x-2)(x+4)^2$

(d) $P(x) = \frac{1}{2}x(x-1)^2(x-2)(x+3)(x+4)$

(e) $P(x) = -\frac{1}{2}x(x-1)(x+2)(x+3)(x+4)$



Question4: Which one of the following statements is TRUE about the graph of the polynomial function $P(x) = x^3(x+2)(x-3)^2$

(a) The graph has four turning points.

(b) The graph crosses the x-axis at three points.

(c) The graph lies above x-axis in the interval $(-2, 0)$.

(d) The graph has 6 x-intercepts.

(e) The graph is tangent at $x = 0$ and $x = 3$.

Question5: By the intermediate value theorem the polynomial

$P(x) = 3x^3 + 7x^2 + 3x + 7$ has atleast one real zero on:

(a) $[0, 1]$

(b) $[-2, -1]$

(c) $[-1, 0]$

(d) $[1,\ 2\ ]$

(e) $[-3, -2]$

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Recitation (3.3)

Question1: When $x^3 - 3x^2 - x - 1$ is divided by $x - \mathrm{k}$, and the remainder is -4, then the sum of all values of k is

(a) 3 (b) 1 (c) – 1 (d) 0 (e) 2

Question2: If $P(x) = x^{105} - x^{10} - 2x + 1$ is divided by $x + 1$, then the remainder is:

(a) 2 (b) 1 (c) -1 (d) 0 (e) -2

Question3: If $x + 2$ is a factor of the polynomial $P(x) = x^3 - kx^2 + 3x + 7k$, then k is equal to

(a) $\frac{10}{3}$ (b) $\frac{13}{3}$ (c) $\frac{11}{3}$ (d) $\frac{16}{3}$ (e) $\frac{14}{3}$

Question4: If $P(x) = -x^3 + kx^2 - 5x - 20$ is divided by $x + 2$, then the set of all values of k which makes the remainder positive is

(a) $\left(\frac{9}{2}, \infty\right)$ (b) $\left(\frac{19}{2}, \infty\right)$ (c) $\left(\frac{11}{2}, \infty\right)$ (d) $\left(\frac{1}{2}, \infty\right)$ (e) $\emptyset$

Question5: If 2 is a zero of multiplicity 2 of $P(x) = x^4 + ax^3 + 8x^2 - 16x + b$ then find $\boldsymbol{a}$ *and* $\boldsymbol{b}$.

Question6: If $\frac{2x^5+x^3-2x^2+3x-5}{x^2-3x+1} = Q(x) + \frac{R(x)}{x^2-3x+1}$, then what are $Q(x)$ and $R(x)$?

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Recitation (3.4)

Question 1: According to Descartes rule of signs, which one of the following is **FALSE** about the zeros of $P(x) = x^5 - x^4 + 2x^2 - x - 1$:

(a) P(x) has three negative zeros and two nonreal complex zeros.

(b) P(x) has three positive zeros and two negative zeros.

(c) P(x) has three positive zeros and two nonreal complex zeros.

(d) P(x) has one positive zeros, two negative zeros, and two nonreal complex zeros.

(e) P(x) has one positive zero and four nonreal complex zeros.

Question 2: Find all rational zeros of the polynomial

$P(x) = x^5 - 4x^4 - 3x^3 + 22x^2 - 4x - 24$, and write it in factored form.

Question 3: The sum of all real zeros of the polynomial

$$P(x) = 2x^4 + 15x^3 + 17x^2 + 3x - 1$$

is:

(a) $-3 + \sqrt{10}$ (b) $-\frac{3}{2}$ (c) $-\frac{15}{2}$ (d) $-3 - \sqrt{10}$ (e) -7

Question 4: The total number of ***x-intercept(s)*** of the polynomial

$P(x) = x^5 + 6x^4 + 13x^3 + 14x^2 + 12x + 8$ is (are)

(a) 0 (b) 1 (c) 2 (d) 3 (e) 4

Question 5: List all possible rational zeros given by the Rational Zeros Theorem, for the following polynomial: $P(x) = 12x^5 + 6x^3 - 2x - 8$

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Recitation (3.5)

Question1: If $-i$ is a zero of the polynomial $P(x) = x^4 - 4x^3 + 5x^2 - 4x + 4$,

then the number of the $x - intercepts$ of the graph of P is equal to

(a) 0 (b) 1 (c) 2 (d) 3 (e) 4

Question2: If $1 + i$ is a zero of $P(x) = x^3 - x^2 - ix^2 - 16x + 16 + 16i,$ then find the **sum of all zeros** of $P(x) =$

(a) 0 (b) $1 + i$ (c) $1 - i$ (d) 4 (e) -4

Question3: Find a polynomial function of least degree having only ***real coefficients*** with zeros $1 + i \; and \; -1 - i.$

Question4: Find all the zeros of the polynomial $P(x) = x^5 + x^3 + 8x^2 + 8$

Question5: Find the polynomial with complex coefficients of the smallest possible degree for which i and $1 + i$ are zeros and in which the coefficient of the highest power is 1.

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Math (001) - Term 171
Recitation (3.6)

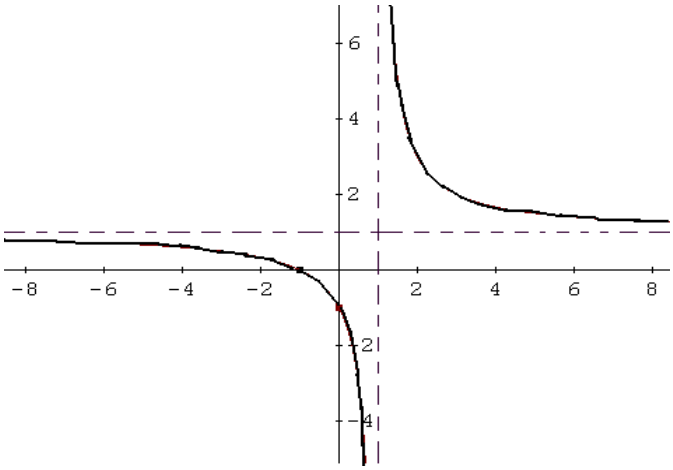
Question 1: If $y = \frac{2}{3}$ is the horizontal asymptote of the function $= \frac{ax-5}{3x-4}$, then the x-intercept of the graph is

(a) $\frac{4}{3}$ (b) $\frac{5}{2}$ (c) $\frac{5}{4}$ (d) $\frac{3}{2}$ (e) $-\frac{1}{2}$

Question 2: The graph of $y = \frac{x^2+3x-2}{2x^2+x+10}$ intersects its horizontal asymptote when x is equal to

$(a)\ \frac{14}{5}$ $(b)\ \frac{-1}{2}$ $(c)\ \frac{11}{5}$ $(d)\ -\frac{2}{5}$ $(e)\ \frac{19}{5}$

Question 3: The following figure represents the graph of



(a) $y = \frac{x}{x-1}$ $(b)\ y = \frac{x+1}{x-1}$ $(c)\ y = \frac{x-1}{x+1}$ $(d)\ y = \frac{2(x+1)}{x-1}$ $(e)\ y = \frac{x+2}{x-1}$

Question 4: Let f be the function whose graph is obtained by translating the graph of $g(x) = \frac{1}{x}$ to the right 3 units and up 2 units.

(a) Write an equation for $f(x)$ as quotient of two polynomials.
(b) Determine the zeros of f.
(c) Identify the asymptotes of the graph of $f(x)$.
(d) What is the domain and range of ?

Question 5: The graph $y = \dfrac{6 - ax}{5 - (a-2)x}$ has a vertical asymptote $x = 5$, then it has a horizontal asymptote given by

(a) $y = \frac{1}{3}$
(b) $y = \frac{3}{2}$
(c) $y = 5$
(d) $y = \frac{6}{5}$
(e) $y = 3$

Question 6: Which one of the following statements is TRUE about the given original rational function $f(x) = \frac{1}{x-1} + 2$?
(a) The graph has a hole at $x = 1$.
(b) The domain of $f(x)$ has all real numbers except 2.
(c) The range of $f(x)$ has all real numbers except 1.
(d) f is increasing for all x in its domain.
(e) The graph has a horizontal asymptote $y = 2$.