

King Fahd University of Petroleum and Minerals
Prep-Year Math Program

Code: 001

Prep-Year Math I
EXAM I
Term 063
Wednesday, July 18, 2007
Net Time Allowed: 110 minutes

Code: 001

Student's Name:

ID #:

Section #:

Important Instructions:

1. All types of CALCULATORS, PAGERS, OR MOBILES ARE NOT ALLOWED to be with you during the examination.
2. Use an HB $2\frac{1}{2}$ pencil.
3. Use a good eraser. Do not use the eraser attached to the pencil.
4. Write your name, ID number and Mathematics Section on the examination paper and in the upper left corner of the answer sheet.
5. When bubbling your ID number and Math Section number, be sure that bubbles match with the number that you write.
6. The test Code Number is already typed and bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.
7. When bubbling, make sure that the bubbled space is fully covered.
8. When erasing a bubble, make sure that you do not leave any trace of penciling.
9. Check that the exam paper has 22 questions.

Q1.

The standard form of the polynomial $(4x - 7)^2 - (3x - 8)^2$ is

A) $15 - 8x + 7x^2$

B) $7x^2 + 8x + 39$

C) $-15 + 8x - 7x^2$

D) $7x^2 - 8x - 15$

E) $7x^2 - 8x + 15$

$$\begin{aligned} & \cancel{16}x^2 - \cancel{56}x + 49 - (9x^2 - 48x) \\ & = 7x^2 - 8x - 15 \end{aligned}$$

Q2.

One factor of $9x^2 + 3x - 2y - 4y^2$ is

A) $3x - 2y + 1$

B) $3x - 2y$

C) $3x + 2y - 1$

D) $3x - 2y - 1$

E) $3x + 2y$

$$\begin{aligned} & \cancel{3x(3x+1)} - 2y(1+2y) \\ & (9x^2 - 4y^2) + (3x - 2y) \\ & (3x - 2y)(3x + 2y) + (3x - 2y) \\ & \boxed{(3x - 2y)(3x + 2y + 1)} \end{aligned}$$

Q3.

The sum of the solutions of the equation $(x - 3)^2 + 24 = 0$ is

Sec 1-3

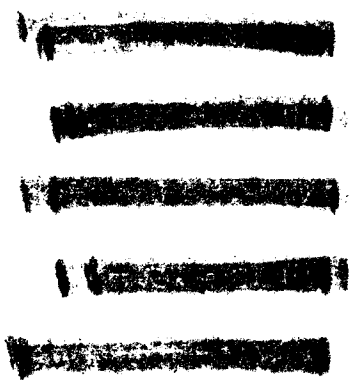
A) $-2\sqrt{6}i$

B) 6

C) 0

D) $2\sqrt{6}i$

E) -6



Q4.

One factor of $8x^3 - (2x - y)^3$ is

A) $12x^2 - 6xy + y^2$

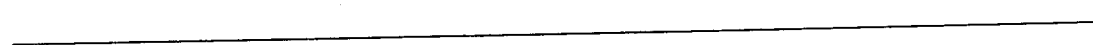
B) $16x^2 - 8xy + y^2$

C) $12x^2 - 6xy$

D) $4x^2 - 2xy + y^2$

E) $12x^2 + y^2$

$$\begin{aligned} & (2x)^3 - (2x - y)^3 \\ & a^3 - b^3 = (a - b)(a^2 + ab + b^2) \\ & = (2x - (2x - y)) \left((2x)^2 + (2x)(2x - y) + (2x - y)^2 \right) \\ & = y \left(4x^2 + 4x^2 - 2xy + 4x^2 - 4xy + y^2 \right) \\ & = y \left(12x^2 - 6xy + y^2 \right) \end{aligned}$$



Q5.

The conjugate of $\frac{(i-2)^2+1}{i-\sqrt{-1}\sqrt{-4}}$ is

A) $\frac{4}{5} + \frac{12}{5}i$

B) $2 - 3i$

C) $\frac{4}{5} - \frac{13}{5}i$

D) $\frac{3}{5} + \frac{12}{5}i$

E) $\frac{4}{5} + \frac{11}{5}i$

$$\frac{i^2 - 4i + i^2 + 1}{i - i(2i)} = \frac{-1 - 4i + 1}{i + 2}$$
$$= \frac{-1 - 4i}{2 + i} = \left(\frac{-1 - 4i}{2 + i} \cdot \frac{2 - i}{2 - i} \right)$$
$$= \frac{(-2 + i - 8i - 4i^2)}{4 + 1}$$
$$= \frac{(2 - i)}{5}$$

Q6.

The solution set of the equation $|3x + 5| = 3x + 5$ is

A) $(-\infty, -\frac{5}{3})$

B) $[\frac{5}{3}, \infty)$

C) $(-\infty, -\frac{5}{3}]$

D) $[-\frac{5}{3}, \infty)$

E) $x = -\frac{5}{3}$

of the form $|a| = a \Rightarrow a \geq 0$

$$3x + 5 \geq 0$$
$$x \geq -\frac{5}{3}$$
$$[-\frac{5}{3}, \infty)$$

Q7.

The sum of the solutions of the equation $3|x - 2| + 2 = 32$ is

A) 20

B) -4

C) -20

D) 4

E) 0

$$3|x - 2| = 32 - 2 = 30$$

$$|x - 2| = \frac{30}{3} = 10$$

$$x - 2 = 10$$

$$\text{or } x - 2 = -10$$

$$x = 12$$

$$x = -8$$

Q8.

The expression

$$\frac{1}{6(x-1)} + \frac{1}{12(x-1)^2} - \frac{1}{9(x-1)^3}$$

simplifies to

$$\text{LCD} = 2^2 \cdot 3^2 \cdot (x-1)^3 = 36(x-1)^3$$

A) $\frac{6x^2 - 9x - 7}{36(x-1)^4}$

B) $\frac{6x^2 + 10x - 1}{36(x-1)^5}$

C) $\frac{6x^2 - 9x - 1}{36(x-1)^3}$

D) $\frac{6x^2 - 10x - 1}{36(x-1)^6}$

E) $\frac{6x^2 - 9x - 4}{36(x-1)^2}$

$$\frac{6(x-1)^2}{36(x-1)^3} + \frac{3(x-1)}{36(x-1)^3} - \frac{4}{36(x-1)^3}$$

$$= \frac{6(x^2 - 2x + 1) + 3x - 3 - 4}{36(x-1)^3}$$

$$= \frac{6x^2 - 9x - 1}{36(x-1)^3}$$

Q9.

The polynomial $4x^2 - (k^2 - 4)x + 9$ is a perfect square for

A) $k = 12$ $= (2x + 3)^2 = 4x^2 + 12x + 9$

B) $k = \pm 4$ $\Rightarrow 12 = k^2 - 4$

C) $k = \pm 3$ $k^2 = 6$

D) $k = 16$ $k = \pm 4$

E) $k = \pm 2$

Q10.

The coefficient of xy^2 of $(3x - 2y)^3$ is

A) 54 $(3x)^3 - 3(3x)^2(2y) + 3(3x)(2y)^2 - (2y)^3$

B) -36 The term of xy^2 is $36y$.

C) 36 coeff = 36

D) -54

E) -30

Q11.

The expression $\frac{1}{x-1} + \frac{1}{2x+3} - \frac{2x^2+11x+12}{x-5}$ simplifies to

$$\begin{aligned} & \frac{1}{x-1} + \frac{1}{2x+3} - \frac{(2x+3)(x+4)}{x-5} \\ &= \frac{1}{x-1} + \frac{x+4}{x-5} \\ &= \frac{(x-5) + (x+4)(x-1)}{(x-1)(x-5)} \\ &= \frac{(x-5) + x^2 + 3x - 4}{(x-1)(x-5)} \\ &= \frac{x^2 + 4x - 9}{(x-1)(x-5)} \end{aligned}$$

- A) $\frac{x^2+4x-9}{(x-1)(x-5)}$
- B) $\frac{x^2+5x-8}{(x-1)(x-5)}$
- C) $\frac{x^2+4x+10}{(x-1)(2x+3)}$
- D) $\frac{x^2+5x-9}{(2x+3)(x-5)}$
- E) $\frac{2x^2+4x-9}{(x+1)(x-5)}$

Q12.

If $\frac{1}{a} + \frac{1}{b} = \frac{1}{c}$ then b is

$$LCD = abc$$

$$abc \left(\frac{1}{a} + \frac{1}{b} \right) = abc \left(\frac{1}{c} \right)$$

$$bc + ac = ab$$

$$ab - bc = ac$$

$$b(a-c) = ac$$

$$b = \frac{ac}{a-c}$$

- A) $\frac{ac}{a+c}$
- B) $\frac{a-c}{ac}$
- C) $\frac{a+c}{ac}$
- D) $\frac{ac}{c-a}$
- E) $\frac{ac}{a-c}$

Q13.

The set

$A = \{y \mid y = 2x - 1 \text{ where } x \text{ is a composite number less than } 10\}$ is

$$= \{y \mid y = 2x - 1 \mid x = 4, 6, 8, 9\}$$

A) {4,6,8,9}

$$= \{7, 11, 15, 17\}$$

B) {1,7,11,15,17}

C) {5,7,13,15,17}

D) {7,13,15}

E) {7,11,15,17}

Q14.

The expression $\left(\frac{-4x^2y^3}{(2xy^2)^3}\right)^{-2}$ simplifies to

A) $4x^2y^6$

B) $-4x^2y^2$

C) $2x^2y^2$

D) $-4xy$

E) $4xy$

$$\left(\frac{-4x^2y^3}{2^3x^3y^6}\right)^{-2} = \left(\frac{8x^3y^6}{-4x^2y^3}\right)^{+2}$$

$$= \left(-\frac{2xy^3}{1}\right)^{+2} = (-2)^2 x^2 y^6$$

$$= 4x^2y^6$$

Q15.

Which one of the following equations is not an identity

(See 1-1)

A) $2(3x - 1) - x = 5x - 2$ $6x - 2 - x = 5x - 2$ *ide*

B) $\frac{4x-12}{4} = x - 3$ $\frac{4(x-3)}{4} = x-3$ *id.*

C) $-3(x-2) = -3x+6$ $-3x+6 = -3x+6$ *id*

D) $3[x - 2(x+5)] + 1 = -3x - 29$ $3(x - 2x - 10) + 1 = 3(-x - 10) + 1$
 $= -3x - 29$ *id*

E) $3[x - (4x - 1)] = -3(2x - 5)$

$3(x - 4x + 1) = 3(-3x + 1) = -9x + 3$
 $-3(2x - 5) = -6x + 15$ ~~\neq~~ *not ide*

Q16.

If the equation $2x^2 + 6x + 1 = 0$ is written in the form $(x + a)^2 = b$ then

$a + b$ is

Sec 1.3.

A) $\frac{13}{4}$

B) $-\frac{15}{4}$

C) 0

D) $-\frac{11}{4}$

E) $-\frac{13}{4}$

Q17.

If $x^2 - kx + 1 = -x$ has only one real root then the values of k are

Sec 1.3

- A) $k = -1$ or $k = 3$
- B) $k = 2$ or $k = 3$
- C) $k = -2$ or $k = 1$
- D) $k = 0$ or $k = 1$
- E) $k = -1$ or $k = 2$

Q18.

The expression $4\sqrt[3]{72} - \frac{12}{\sqrt[3]{81}}$ simplifies to

A) $\frac{-72\sqrt[3]{9}}{3}$

B) $32\sqrt[3]{9}$

C) $\frac{20\sqrt[3]{9}}{3}$

D) $\frac{62\sqrt[3]{9}}{3}$

E) $\frac{-63\sqrt[3]{9}}{3}$

$$4\sqrt[3]{2^3 \cdot 3^2} - \frac{12}{\sqrt[3]{3^4}}$$
$$= 4 \cdot 2\sqrt[3]{9} - \frac{12}{3\sqrt[3]{3}}$$
$$= 8\sqrt[3]{9} - 4 \cdot \frac{\sqrt[3]{3^2}}{\sqrt[3]{3} \sqrt[3]{3^2}} =$$
$$= 8\sqrt[3]{9} - \frac{4\sqrt[3]{9}}{3} = \frac{24\sqrt[3]{9} - 4\sqrt[3]{9}}{3}$$

$= \frac{20\sqrt[3]{9}}{3}$

$$\begin{array}{r|l} 72 & \\ \hline 36 & 2 \\ 18 & 4 \\ 9 & 8 \\ 1 & \end{array}$$

Q19.

The expression $\frac{(2 \times 10^{-8})(8.4 \times 10^6)}{(3 \times 10^{-7})(1.4 \times 10^{17})}$ is written in the scientific notation form as

A) 4×10^{-12}

B) 4×10^{-16}

C) 6×10^{-15}

D) 2×10^{-14}

E) 4×10^{12}

$$\frac{2 \cdot 8.4}{3 \cdot (1.4)} \cdot \frac{10^6 \cdot 10^7}{10^8 \cdot 10^{17}} =$$
$$= \frac{8.4}{3 \cdot (0.7)} \cdot \frac{1}{10^{12}}$$
$$= \frac{8.4}{2.1} \cdot 10^{-12}$$
$$= \boxed{4 \cdot 10^{-12}}$$

Q20.

The length L of a rectangle is 1 foot less than twice the width W . If the perimeter of the rectangle is 190, then $L - W =$

A) 34

B) 32

C) 31

D) 30

E) 33

$$L = 2w - 1$$
$$P = 2L + 2w = 190 \rightarrow L + w = 95$$
$$2w - 1 + w = 95$$
$$3w = 96 \Rightarrow w = \frac{96}{3} = 32$$
$$L = 2(32) - 1 = 64 - 1 = 63$$
$$L - W = 63 - 32 = 31$$

Q21.

The expression $\frac{|-3x| + |x-5|}{|2x| - |-x|}$, where $-3 < x < 0$ simplifies to

A) $\frac{5+4x}{x}$ $= \frac{|-3x| + |x-5|}{|2x| - |-x|} = \frac{-3x + (5-x)}{-2x - (-x)}$

B) $\frac{5-4x}{3x}$ $= \frac{-4x + 5}{-x} = \frac{-4x + 5}{-x} = \frac{4x-5}{x}$

C) $\frac{4x-5}{3x}$

D) $\frac{-5-2x}{2x}$

E) $\frac{4x-5}{x}$

Q22.

The expression $\frac{1}{i^{25}} + \frac{2}{i^{83}} + i^{-34}$ simplifies to

A) $1-i$ $\frac{1}{i^1} + \frac{2}{i^3} + \frac{1}{i^{34}} = \frac{1}{i} - \frac{2}{i} + \frac{1}{-1} = -\frac{1}{i} - 1$

B) $1+i$

C) $-1+i$ $= \frac{1}{i}(1-2) - 1 = \frac{-1}{i} - 1$

D) $-1-i$ $= \frac{-(-i)}{i(-i)} - 1 = \frac{i}{-1} - 1 = -i - 1$

E) $-i$

$= -1 - i$