CODE 002

King Fahd University of Petroleum and Minerals
Math Prep-Year Program
Math 001-Term 041

TEST 1

NAME: KEY SEC______ ID ____________ Sr. No.#:____

SHOW ALL NECESSARY WORKING

1. **TRUE OR FALSE QUESTIONS**

a) The equation $x^2 = x$ has one real solution F

b) 5 is the solution of the equation $\frac{x}{x-5} = 1 - \frac{5}{x-5}$ F

c) $\frac{x}{x-2} = \frac{2}{x-2}$ *and* $2x - 3 = 1$ are equivalent equations F

d) If $\sqrt{a} + \sqrt{b} = c$, *then* $a + b = c^2$ F

e) The equation $3|x-1| + 12 = 9$ has no solution T

f) If $(a-b) = 4$, *then* $4 = (a-b)$ T

i) If $x < 0$, then $|-x| = -x$ T

j) The equation $\frac{1}{3}x^2 - \frac{1}{4}x + 5$ has two distinct real solutions F

k) $|x+y| = |x| + |y|$ F

l) Prime numbers are not closed under addition T

2. Factor: $x^2 - 2xy + y^2 - x^3 + y^3$

$(x-y)^2 - (x^3 - y^3)$

$(x-y)^2 - (x-y)(x^2+xy+y^2)$

$(x-y)[x-y-(x^2+xy+y^2)]$

$= (x-y)(x-y-x^2-xy-y^2)$

$(x-y)(x-y-x^2-xy-y^2)$

ANS:

3. Simplify the expression $\dfrac{2}{2x^2+x} - \dfrac{x^2-x+1}{2x^3-x^2} \div \dfrac{x^3+1}{2x^2+x-1}$.

$\dfrac{2}{x(2x+1)} - \dfrac{(x^2-x+1)}{x^2(2x-1)} \div \dfrac{(x+1)(x^2-x+1)}{(2x-1)(x+1)}$

$= \dfrac{2}{x(2x+1)} - \dfrac{(x^2-x+1)}{x^2(2x-1)} \times \dfrac{(2x-1)}{(x^2-x+1)}$

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

$= \dfrac{2x-(2x+1)}{x^2(2x+1)} = \dfrac{\cancel{2x}-\cancel{2x}-1}{x^2(2x+1)}$

$=$ ANS: $\boxed{\dfrac{-1}{x^2(2x+1)}}$

4. The expression $\dfrac{2^{n+4}-2(2^n)}{2(2^{n+3})}$ simplifies to:

$\dfrac{2^n \cdot 2^4 - 2 \cdot 2^n}{2 \cdot 2^n \cdot 2^3} = \dfrac{\cancel{2^n}(2^4-2)}{\cancel{2^n}(2 \cdot 2^3)}$

$= \dfrac{16-2}{16} = \dfrac{14}{16}$

$= \dfrac{7}{8}$

ANS: $\boxed{7/8}$

5. The expression $\sqrt[3]{\sqrt{64x^{10}y^6}}$ simplifies to:

$2|xy|\sqrt[6]{x^4}$ — 3

$2|xy|\sqrt[3]{x^2}$ — 2

ANS:

6.

a) Solve the formula $\frac{X}{Y}=\frac{A-B}{B-C}$, for B.

Multiply by $y(B-C)$

$x(B-C) = y(A-B)$

$xB - xC = yA - yB$

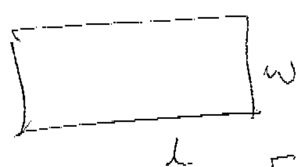
$xB + yB = yA + xC$

$B(x+y) = yA + xC$

$B = \frac{yA+xC}{x+y}$

ANS: $\frac{Ay+xC}{x+y}$

b) The length of rectangle is 9 feet less than twice the width of the rectangle. If the perimeter of the rectangle is 54 feet, then find the width and the length of the rectangle.



$l = 2w - 9$ — 1

$54 = 2(l+w)$ — 2

$w = 12$

$l = 15$

From 2: ~~27 = 2l~~

$27 = l + w = 2w - 9 + w$

$27 = 3w - 9$

$3w = 36$

ANS: 12 and 15 feet

c) Solve $4x^2-3x+15=x$ by completing the square

$4x^2 - 3x - x + 15 = 0$

$4x^2 - 4x + 15 = 0$

$x^2 - x + \frac{15}{4} = 0$

$x^2 - x = -\frac{15}{4}$

$(x-\frac{1}{2})^2 = -\frac{15}{4} + \frac{1}{4}$

$(x-\frac{1}{2})^2 = \frac{-14}{4}$

$x - \frac{1}{2} = \pm\frac{\sqrt{-14}}{2} = \pm\frac{i\sqrt{14}}{2}$

$x = \frac{1}{2} \pm \frac{i\sqrt{14}}{2}$

ANS: $\frac{1}{2} \pm i\frac{\sqrt{14}}{2}$

7. Given $Z = \dfrac{(1-i)^2}{\sqrt{-2}\sqrt{-8} - i^{203}}$.

$i^{203} = i^3 = -i$

i) Write Z in the standard form.

$\dfrac{1-2i+i^2}{(i\sqrt{2})(2i\sqrt{2}) - i^3}$

$= \dfrac{1-2i-1}{-4-(-i)}$

$= \dfrac{-2i}{-4+i}$

$\dfrac{-2i}{(-4+i)} \cdot \dfrac{(-4-i)}{(-4-i)}$

$= \dfrac{8i+2i^2}{17}$

$= \dfrac{-2}{17} + \dfrac{8i}{17}$

ANS: $\boxed{\dfrac{-2}{17} + \dfrac{8}{17}i}$

ii) Find the conjugate of Z.

$\dfrac{-2}{17} - \dfrac{8}{17}i$

ANS: $\boxed{\dfrac{-2}{17} - \dfrac{8}{17}i}$

8. Solve the equation $\sqrt{4x+1} - \sqrt{2x+4} = 1$

$\left(\sqrt{4x+1}\right)^2 = \left(1 + \sqrt{2x+4}\right)^2$

$4x+1 = 1 + 2\sqrt{2x+4} + 2x+4$

$2x - 4 = 2\sqrt{2x+4}$

$(x-2)^2 = \left(\sqrt{2x+4}\right)^2$

$x^2 - 4x + 4 = 2x+4$

$x^2 - 6x = 0$

$x(x-6) = 0$

$x = 0$ or $x = 6$

ANS: $\boxed{x = 6.}$

Check:

$x = 0$

$\sqrt{1} - \sqrt{4} = 1$

$1 - 2 = 1$

$-1 \neq 1$

Not solution

$x = 6$

$\sqrt{25} - \sqrt{16} = 1$

$5 - 4 = 1$

$1 = 1$

solution

$S.S = \{6\}$