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

Prep-Year Math I
MIDTERM EXAM
Semester II, Term 062
Saturday, April 21, 2007
Net Time Allowed: 120 minutes

Sources of Problems

MASTER VERSION

1. The value of $y - 3[2x - 4(3x - y)]$ when $x = \dfrac{1}{5}$ and $y = -\dfrac{1}{11}$ is:

~~(a)~~ 7

(b) -5

(c) 3

(d) -3

(e) -7

See example 9 p. 13
and problems 105, 106 p. 17

2. If $f(x) = 3 - 2[1 - x]$, where $[x]$ is the greatest integer function, then the value of $f\left(\dfrac{9}{2}\right)$ is equal to

~~(a)~~ 11

(b) 13

(c) 9

(d) -4

(e) -5

See problems 43 to 46 p. 191

3. The **sum** of all solutions of the equation

$$(x+1)^{2/3} = (x+1)^{1/3} + 6$$

is

See example 9 p. 124

and problems 49, 50 p. 126

(a) 17

(b) -13

(c) -26

(d) 15

(e) 0

4. If $y - b = m(x - a)$, then x is equal to

See example 1 p. 91

and problems 1 to 10 p. 98

(a) $\dfrac{y - b + ma}{m}$

(b) $my - ba + a$

(c) $\dfrac{y - b + a}{m}$

(d) $y - b + ma$

(e) $\dfrac{m + ay - ab}{y - b}$

5. The **sum** of all **solutions** of the equation

$$\frac{5}{3} - 4|3x - 6| = -\frac{19}{3}$$

is equal to

(a) 4

(b) 6

(c) 3

(d) 2

(e) 12

See example 5 p. 86

and problems 33 to 48 p. 88

6. If $i = \sqrt{-1}$ and $z = \dfrac{7-3i}{1+i} - i^{51}$, then the **conjugate** of z in standard form is

(a) $\overline{z} = 2 + 4i$

(b) $\overline{z} = 2 + 6i$

(c) $\overline{z} = -2 - 4i$

(d) $\overline{z} = -2 + 4i$

(e) $\overline{z} = 2 - 6i$

See examples 4 and 5 p. 70–71

and problems 41 to 62 p. 72

7. The **sum** of the **real part** and the **imaginary part** of the complex number $z = 3(2+5i) - 2i(2-3i) + \sqrt{-12} \cdot \sqrt{-27}$, where $i = \sqrt{-1}$, is equal to

(a) -7

See problems 13 to 26 p. 72

(b) -5

(c) $29i$

(d) $-7i$

(e) 5

8. Which one of the following sets of ordered pairs (x, y) or relations defines y as a function of x?

See example 3 p. 181 and problems 11 to 26 p. 191

(a) $\{(-3,0), (0,0), (1,0), (7,0)\}$

(b) $-4x^2 + y^2 = 9$

(c) $\left\{(-100,1), \left(0,-\frac{1}{2}\right), \left(0,\frac{1}{2}\right), (100,-1)\right\}$

(d) $x = \sqrt{y^2+1}$

(e) $\sqrt{x^2 - y^2} = 4$

9. The rational expression $\dfrac{\dfrac{2y^2-5y-12}{(y-6)(y-4)}}{\dfrac{(2y-3)(2y+3)}{y^2-9y+18}}$ simplifies to

(a) $\dfrac{y-3}{2y-3}$

(b) $\dfrac{2y+3}{y-3}$

(c) $\dfrac{2y-3}{y-3}$

(d) $\dfrac{y-3}{2y+3}$

(e) $\dfrac{(y-4)(y-3)}{(y-12)(y-2)}$

See example 2 p.58 and problems 57,58 p.63

10. If the distance between the points $A(x+4, 2x)$ and $B(x, -1)$ is 5, then the value of $3x-1$ when $x>0$ is equal to

See problems 15,16 p.174

(a) 2

(b) 6

(c) 5

(d) 3

(e) 0

11. The circle $x^2+y^2-3x+2y+1=0$ [Hint: sketch]

(a) touches the y-axis only

(b) touches the x-axis only

(c) touches both the x- and y-axes

(d) lies completely above the x-axis

(e) lies completely below the x-axis

See example 7 P.173
and problems 69 to 72 P.175
and problem 76 P.175
and problems 95,96 P.176

12. The equation $\dfrac{2}{x+2}+\dfrac{3}{x-2}=\dfrac{12}{x^2-4}$ is

(a) a contradiction

(b) conditional

(c) an identity

(d) equivalent to the equation $x=2$

(e) equivalent to the equation $3x+1=0$

see example 4 P.85
and problems 23 to 32 P.88

13. The width of a rectangle is 2 meters more than half the length of the rectangle. If the perimeter of the rectangle is 120 meters, then its **width** is equal to

(a) $\frac{64}{3}$ meters

(b) $\frac{55}{3}$ meters

(c) $\frac{73}{3}$ meters

(d) 20 meters

(e) 23 meters

See example 3 p.93
and problems 19, 20 p.99

14. If the discriminant of the equation

$$\sqrt{2}x^2 + kx + \frac{\sqrt{2}}{5} = 0$$

is equal to $\frac{8}{45}$, then a possible value of k is

(a) $\frac{4}{3}$

(b) $\frac{2}{3}$

(c) $\frac{1}{3}$

(d) $\frac{5}{3}$

(e) 3

See example 6 p.109
and problems 47 to 56 p.113

15. The expression $\dfrac{6x-27}{3-\sqrt{18-2x}}$ simplifies to

(a) $3[3+\sqrt{18-2x}]$

(b) $-9[3+\sqrt{18-2x}]$

(c) $\frac{1}{6}[3+\sqrt{18-2x}]$

(d) $9[3+\sqrt{18-2x}]$

(e) $-[3+\sqrt{18-2x}]$

See example 9 p. 31
and problems 107 to 112 p. 33

16. If A is the leading coefficient and B is the coefficient of x in the polynomial

$$P(x) = (2x-3)^3 - (3x-2)^2,$$

then $A+B=$

(a) 74

(b) 82

(c) 64

(d) 38

(e) 56

See example 1 p. 36
and problems 11 to 16 p. 41
and problems 84 to 89 p. 43

17. $\dfrac{1}{x^2+3x+2} - \dfrac{1}{x^2-2x-3} =$

(a) $\dfrac{-5}{(x+1)(x+2)(x-3)}$

(b) $\dfrac{3}{(x+1)^2(x+2)(x-3)}$

(c) $\dfrac{-9}{(x+1)(x+2)(x-3)}$

(d) $\dfrac{2x+1}{(x+1)^2(x+2)(x-3)}$

(e) $\dfrac{-12}{(x+1)(x+2)(x-3)}$

See example 3 P.59
and problems 25 to 32 P. 63

18. The domain, in interval notation, of the function $f(x) = \dfrac{16}{\sqrt{x^2+4x+12}}$ is equal to

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

(b) $(-\infty, -6) \cup (-2, \infty)$

(c) $(-6, -2)$

(d) $(-\infty, -6) \cup (2, \infty)$

(e) $(-\infty, -2) \cup (6, \infty)$

See example 4 P. 182
and problems 27 to 38 P. 191

19. The solution set, in interval notation, of the inequality

$$\frac{-x^2+x+6}{(x+1)(x^2+1)} \leq 0$$

is equal to

See problems 47 to 50 P. 140

(a) $[-2,-1) \cup [3,\infty)$

(b) $[-3,-1) \cup [2,\infty]$

(c) $[-3,-2] \cup (-1,\infty)$

(d) $(-\infty,-3] \cup [-2,-1)$

(e) $(-\infty,-2] \cup (-1,3]$

20. One of the factors of $16x^2 - 25y^2 + 24x + 9$ is

See problems 81, 82 p. 54

(a) $4x - 5y + 3$

(b) $4x + 5y - 3$

(c) $2x - 5y + 3$

(d) $4x + 5y + 9$

(e) $8x - y + 3$

21. The expression $(1+x^3)^{-1}+(1+x^{-3})^{-1}$ simplifies to

(a) 1

See problems 59 to 62 P. 64

(b) $2+x^3+x^{-3}$

(c) $\dfrac{2}{1+x^3}$

(d) $\dfrac{2x^3}{1+x^3}$

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

22. If $|3-2x|\leq 5$ is equivalent to $m\leq 5x+2\leq n$, then

(a) $m=-3$ and $n=22$

See example 3 p.132

and problems 17 to 24 P. 140

(b) $m=7$ and $n=22$

(c) $m=-23$ and $n=27$

(d) $m=-2$ and $n=27$

(e) $m=4$ and $n=11$

23. When rationalized, the expression $\dfrac{2xy}{\sqrt[5]{64x^7y^8}}$ is equal to

(a) $\dfrac{\sqrt[5]{16x^3y^2}}{2xy}$

(b) $\sqrt[5]{2xy}$

(c) $\dfrac{\sqrt[5]{4xy^2}}{2xy}$

(d) $\dfrac{\sqrt[5]{8x^2y^3}}{2xy}$

(e) $\dfrac{1}{\sqrt[5]{2xy}}$

See problems 103 to 106 P. 33

See also example 6 p. 30

24. If $-1 < x < 1$, then the expression

$$|x^2 + 2| + |x^2 - 2| + \sqrt{(x-2)^2}$$

simplifies to

See problems 31 to 40 P. 16

(a) $6 - x$

(b) $2x^2 + x - 2$

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

(d) $2 - x$

(e) $x + 2$

25. If $x = k$ is the solution of the equation $2x = 1 - \sqrt{2 - x}$, then $8k + 1 =$

(a) -1

(b) 9

(c) -7

(d) 1

(e) 7

See example 6 p. 122
and problems 29, 30 p. 126