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

Prep-Year Math I
FIRST EXAM
Semester I, Term 061
Saturday, October 7, 2006
Net Time Allowed: 75 minutes

MASTER VERSION

"Sources"

1. Write without absolute values and simplify

$$|-3x| + \sqrt{(x-3)^2} + 2|x+1|, \quad -3 < x < -2$$

(a) $1 - 6x$

(b) $4x + 1$

(c) 1

(d) $2x - 5$

(e) $5 - 2x$

See Problems # 31 to 40 p. 16
and # 125 and 126 p. 18

2. If $A = \{x|x \leq -3\} \cup \{x|x > 1\}$ and $B = \{x|-6 \leq x < 8\}$, then $A \cap B =$

(a) $\{x|-6 \leq x \leq -3\} \cup \{x|1 < x < 8\}$

(b) $\{x|-6 \leq x < 1\}$

(c) $\{x|-3 \leq x < 1\} \cup \{x|1 < x < 8\}$

(d) $\{x|-6 \leq x \leq -3\}$

(e) $\{x|-3 \leq x < 8\}$

See Example 3 p. 6

See Probems # 3 to 18
p. 15

3. If $x > 0$, then the expression $\left[\dfrac{(3x^2)^{-1}(3x^5)^{-2}}{(3^{-1}x^{-2})^2}\right]^{-1}$ is equal to

(a) $3x^8$

See Example 2 P.22
See Problems # 13 to 32 and 49 to 70 P.32

(b) $9x^6$

(c) $3x^4$

(d) $9x^3$

(e) $27x^4$

4. The degree n and the leading coefficient L of the polynomial $(2-3x^2-x)^3(2x+5)$ are

(a) $n = 7$ and $L = -54$

See Example 1 P.36
See Problems 11 to 16 P.41

(b) $n = 6$ and $L = 54$

(c) $n = 7$ and $L = -18$

(d) $n = 6$ and $L = -27$

(e) $n = 7$ and $L = 27$

5. One of the factors of $8x^6 - 15x^3 - 2$ is

(a) $4x^2 - 2x + 1$

(b) $2x^2 - 4x - 1$

(c) $4x^2 - 2x - 2$

(d) $4x^3 - 2x + 2$

(e) $2x^2 - 4x + 2$

See Example 10 P. 52
See problems # 69 to 88 P. 54

6. One of the factors of $4x^2 + 4x + 1 - y^2$ is

(a) $2x - y + 1$

(b) $2x + y - 1$

(c) $2x - y$

(d) $2x + y$

(e) $4x - y - 1$

See Example 9 P. 51
See problems 63 to 68 P. 54

7. $\dfrac{y^2+7y+12}{y^3-3y^2+9y} \div \dfrac{y^2+6y+9}{y^3+27} =$

(a) $\dfrac{y+4}{y}$

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

(c) $\dfrac{y+4}{y+3}$

(d) $\dfrac{y+3}{y+4}$

(e) $\dfrac{y+3}{y}$

See Example 2 P. 58

See Problems # 19 & 22 P. 63

8. $\dfrac{\dfrac{3y}{y-5}-\dfrac{2}{y-5}}{2(y-2)^{-1}+y^{-1}} =$

(a) $\dfrac{y(y-2)}{y-5}$

(b) $\dfrac{y(y+5)}{y-2}$

(c) $\dfrac{(y-2)(y-5)}{y}$

(d) $y(y-2)(y-5)$

(e) $\dfrac{y}{(y-2)(y-5)}$

See Examples 4 and 5 P. 60-61

See Problems # 41 & 56 P. 63

9. $\dfrac{3x-4}{4x-1} - \dfrac{3x+6}{(1-4x)(x+2)} =$

See Example 3 p. 59

See Problems # 23 to 32 p. 63

~~(a)~~ $\dfrac{3x-1}{4x-1}$

(b) $\dfrac{3x-5}{(4x-1)(x+2)}$

(c) $\dfrac{3x-2}{(4x-1)^2(x+2)}$

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

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

10. The **conjugate** of the complex number $\dfrac{8+i^7}{2+3i^{13}}$ in standard form is

See Examples 4 and 5 p. 70-71

See Problems # 41 to 50 } p. 72
and # 55 to 62 }

~~(a)~~ $1+2i$

(b) $\dfrac{3}{13} - \dfrac{5}{13}i$

(c) $2-i$

(d) $\dfrac{3}{13} + \dfrac{5}{13}i$

(e) $3-2i$

11. If $i = \sqrt{-1}$ and $z = 1 + i\sqrt{3}$, then the expression $\frac{1}{i}(z^2 - 2z)$ is equal to

See # 75 and 76 p. 72

(a) $4i$

(b) $-2 + 3i$

(c) $-3i$

(d) $1 - 3i$

(e) $6i$

12. If P and Q are any two different polynomials each of degree $n > 1$, then which one of the following statements is **ALWAYS TRUE**?

See Topics For Discussion (#2) p. 40

(a) $P - Q$ is a polynomial of degree $\leq n$

(b) $P + Q$ is a polynomial of degree n

(c) $P - Q$ is a polynomial of degree $< n$

(d) PQ is a polynomial of degree n^2

(e) $P + P$ is a polynomial of degree $2n$

13. If $2^{x-1} = y$, then $2^{3x-2} =$

(a) $2y^3$

See Connecting Concepts #126 p. 34

(b) $\frac{y^3}{8}$

(c) $4y^3$

(d) $\frac{y^3}{4}$

(e) $\frac{y^3}{2}$

14. $\frac{-2}{1+2\sqrt{12}-3\sqrt{3}} =$

See problems # 81 & 84 p. 32
and # 107 & 112 p. 33

(a) $1-\sqrt{3}$

(b) $2+\sqrt{3}$

(c) $1-2\sqrt{3}$

(d) $5-\sqrt{3}$

(e) $-2-\frac{5}{9}\sqrt{3}$

15. Which one of the following statements is **ALWAYS TRUE**?

(a) the product of two prime numbers is a composite number

(b) every rational number has a multiplicative inverse

(c) the sum of two prime numbers is a prime number

(d) the sum of two irrational numbers is an irrational number

(e) the product of two irrational numbers is an irrational number

See Example 1 p.4 and Properties of Real Numbers p. 12.