MAT 011, Exam #4, Fall 2015   Name _____**KEY**_____

Instruction: Show all work. Answers without work will not receive full credit. Provide exact answers unless specifically asked to round.

1. Factor out the GCF. (3 points each)
   a. $6x^2y^2 - 3xy^3$

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

   b. $11x(4x-3) - 6(4x-3)$

   $(4x-3)(11x-6)$

2. Factor by grouping. (4 points each)
   a. $3a^2 + 9ab + 3b^2 + ab$

   $3a(a+3b) + b(3b+a)$

   $(a+3b)(3a+b)$

   b. $3x^3 - 4x^2 + 6x - 8$

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

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

3. Factor each trinomial. (5 points each)
   a. $x^2 - 11x + 24$

   $(x-3)(x-8)$

   d. $2x^2 + 13x + 6$

   $(2x+1)(x+6)$

   b. $x^2 - x + 2$

   prime

   e. $x^2 + 8xy + 15y^2$

   $(x+5y)(x+3y)$

   c. $4x^2 - 28xy + 49y^2$

   $(2x-7y)(2x-7y)$

4. Factor each binomial. (5 points each)
   a. $4x^2 - 9$

$$(2x-3)(2x+3)$$

c. $16x^2 + y^2$

prime

b. $8x^3 + 27$

$$(2x+3)(4x^2 - 6x + 9)$$

d. $16x^4 - 1$

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

5. Solve the equation. (6 points each)
   a. $(x + 6)(x - 2) = 0$

$$X = -6, \ X = 2$$

c. $x^2 + 10x = -25$

$$x^2 + 10x + 25 = 0$$
$$(x+5)(x+5) = 0$$
$$X = -5$$

b. $4t^3 - 5t^2 - 21t = 0$

$$t(4t^2 - 5t - 21) = 0$$

$$t(4t+7)(t-3) = 0$$
$$t = 0, \ t = \frac{-7}{4}, \ t = 3$$

6. A rocket is fired from the ground with an initial velocity of 440 feet per second. Its height after t seconds is given by $h = -16t^2 + 440t$.

   a. How many seconds pass before the rocket reaches 2800 feet? (7 points)

   $$-16t^2 + 440t = 2800$$
   $$-16t^2 + 440t - 2800 = 0$$
   $$-8(2t^2 - 55 + 350) = 0$$
   $$-8(2t^2 - 20t - 35t + 350) = 0$$
   $$-8[2t(t-10) - 35(t-10)] = 0$$
   $$-8(2t-35)(t-10) = 0$$

   $t = 10$, $t = \frac{35}{2}$ Seconds
   going up   coming down
   17.5

   b. How many seconds pass before the rocket hits the ground? (7 points)

   $$-16t^2 + 440t = 0$$
   $$-8t(2t - 55) = 0$$
   $$t = 0 \text{ (launch)}$$
   $$t = \frac{55}{2} \text{ seconds}$$
   27.5

7. The perimeter of the triangle is 48 inches. Find the lengths of the sides. (9 points)

   $19 = x^2 + 3$ $4x + 5 = 21$

   $2x = 8$
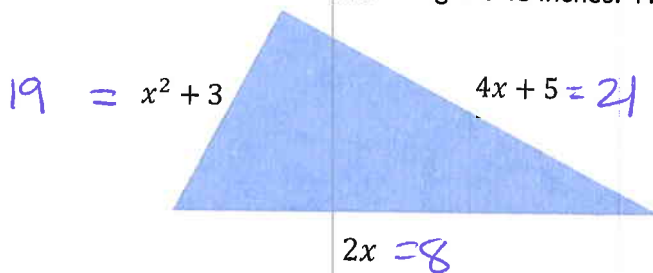
   $$x^2 + 3 + 4x + 5 + 2x = 48$$
   $$x^2 + 6x + 8 = 48$$

   $$x^2 + 6x - 40 = 0$$
   $$(x+10)(x-4) = 0$$
   $$x = -10 \qquad x = 4$$
   disregard

BONUS: Factor the polynomial $x^6 - 1$ completely. [Hint: you should end up with 4 factors.] (8 points)

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