MCF3M Unit #4 Practice Test
Standard and ~~Vertex Forms~~

Name: Master

COMMUNICATION **Level 1 2 3 4**
The test will be marked overall for proper format and communication.

KNOWLEDGE **Level 1 2 3 4**

1. Write the following in standard form.

a) $f(x) = (x + 3)^2 - 7$

$= x^2 + 6x + 9 - 7$

$= x^2 + 6x + 2$

b) $f(x) = -3(x + 5)^2 + 2$

$= -3(x^2 + 10x + 25) + 2$

$= -3x^2 - 30x - 75 + 2$

$= -3x^2 - 30x - 73$

2. Write in vertex form by completing the square.

a) $f(x) = x^2 - 10x + 33$

$= (x^2 - 10x) + 33$

$= x^2 - 10x + (-5)^2 - (-5)^2 + 33$

$= x^2 - 10x + 25 - 25 + 33$

$= (x - 5)^2 + 8$

$h = \frac{b}{a} \div 2$

$= \frac{-10}{1} \div 2$

$= -5$

b) $f(x) = -5x^2 + 20x - 12$

$= -5(x^2 - 4x) - 12$

$= -5(x^2 - 4x + (-2)^2 - (-2)^2) - 12$

$= -5(x^2 - 4x + 4 - 4) - 12$

$= -5(x - 2)^2 + 20 - 12$

$= -5(x - 2)^2 + 8$

$h = \frac{b}{a} \div 2$

$= \frac{20}{-5} \div 2$

$= -2$

3. Solve using the quadratic formula.

a) $x^2 - 6x - 8 = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(-8)}}{2(1)}$

$= \frac{6 \pm \sqrt{36 + 32}}{2}$

$= \frac{6 \pm \sqrt{68}}{2}$ or $x = \frac{6 + \sqrt{68}}{2} \doteq 7.1$

$x = \frac{6 - \sqrt{68}}{2} = -1.1$

b) $3x^2 + x = -9$

$3x^2 + x + 9 = 0$

$x = \frac{-1 \pm \sqrt{(1)^2 - 4(3)(9)}}{2(3)}$

$x = \frac{-1 \pm \sqrt{1 - 108}}{6}$

$x = \frac{-1 \pm \sqrt{-107}}{6}$ ∴ No solutions

4. Without solving, determine the number of real solutions of each equation.

a) $2x^2 - 8x + 8 = 0$

$d = b^2 - 4ac$

$d = (-8)^2 - 4(2)(8)$

$= 64 - 64$

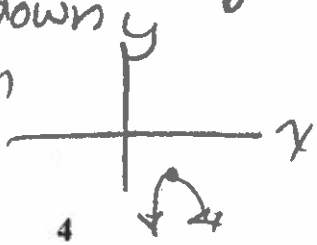
$= 0$

$\therefore$ 1 solution

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

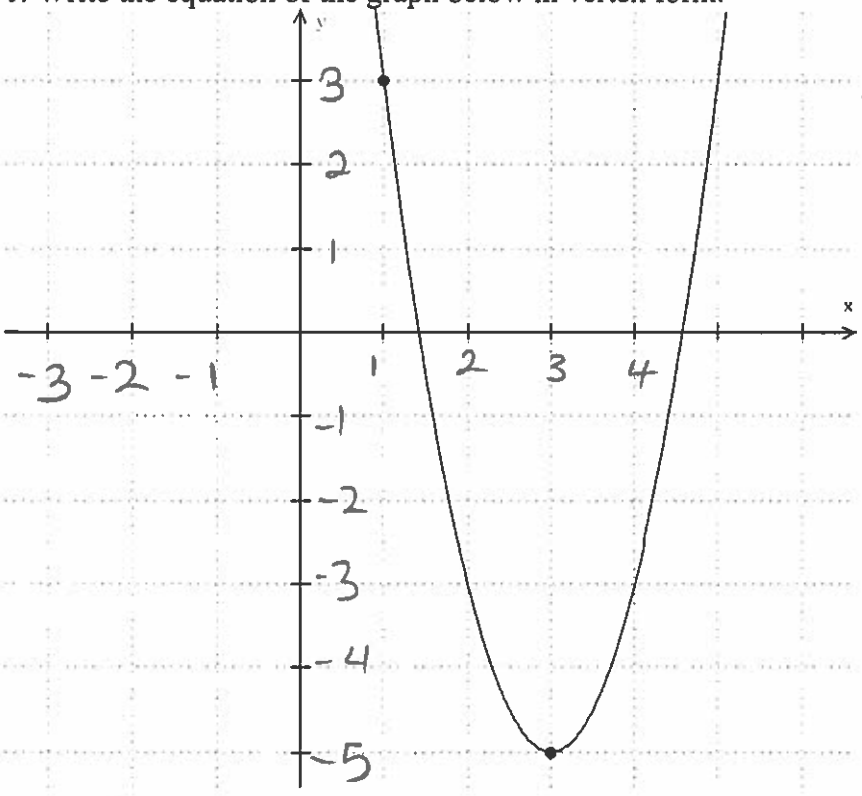
$V(3, -3)$, direction of opening is down

$\therefore$ no solution



APPLICATION **Level 1 2 3 4**

1. Write the equation of the graph below in vertex form.



$y = a(x-h)^2 + k$

sub in vertex

$y = a(x-3)^2 - 5$

sub in (1, 3)

$3 = a(1-3)^2 - 5$

$3 = 4a - 5$

$3 + 5 = 4a$

$8 = 4a$

$a = 2$

$\therefore y = 2(x-3)^2 - 5$

2. The height of a soccer ball is modelled by $h(t) = -4.9t^2 + 19.6t + 0.5$, where height, $h(t)$, is in metres and time, t, is in seconds.

a) What is the height of the ball after 1 s?

b) When does the ball hit the ground?

a) $t = 1$ $h(1) = -4.9(1)^2 + 19.6(1) + 0.5$

$= 15.2$

$\therefore$ height is 15.2 m after 1 sec.

b) $h(t) = 0$

$0 = -4.9t^2 + 19.6t + 0.5$

$x = \frac{-19.6 \pm \sqrt{(19.6)^2 - 4(-4.9)(0.5)}}{2(-4.9)}$

$x = \frac{-19.6 \pm \sqrt{384.16 + 9.8}}{-9.8}$

$x = \frac{-19.6 \pm \sqrt{393.96}}{-9.8}$

$x = \frac{-19.6 + \sqrt{393.96}}{-9.8}$ or $x = \frac{-19.6 - \sqrt{393.9}}{-9.8}$

$x = -0.03$ $x = 4.03$

3. Determine the vertex, the axis of symmetry, the direction of opening, and the number of zeros for the parabola below. Use this information to sketch a graph.

$f(x) = -3x^2 + 42x - 141$

$= -3(x^2 - 14x) - 141$

$= -3(x^2 - 14x + (-7)^2 - (-7)^2) - 141$

$= -3(x-7)^2 + 147 - 141$

$= -3(x-7)^2 + 6$

Vertex $= (7, 6)$

axis of sym $= 7$

direction of opening is down

$h = \frac{b}{a} \div 2$

$= \frac{42}{-3} \div 2$

$= -7$

# of zeros

$d = b^2 - 4ac$

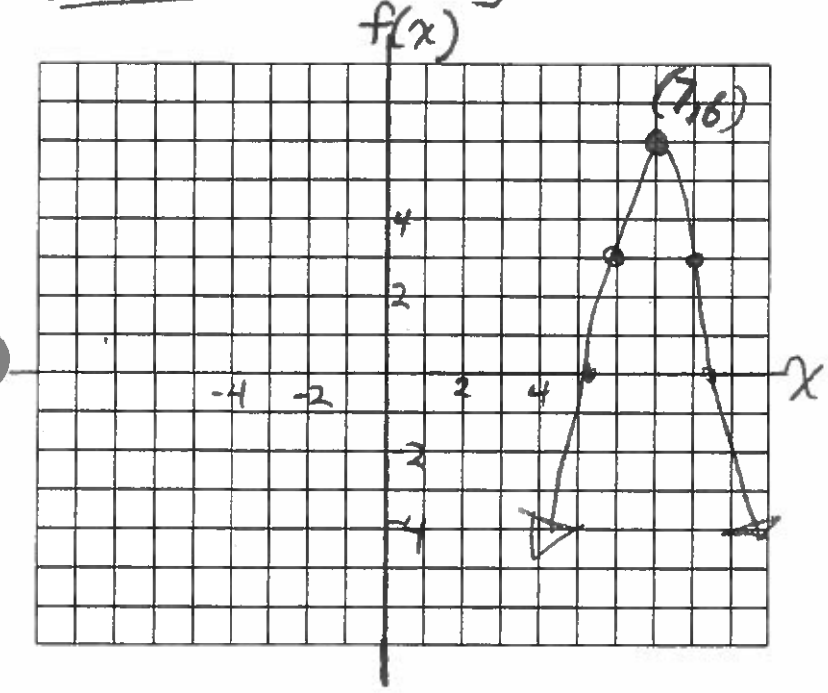
$= 42^2 - 4(-3)(-141)$

$= 1764 - 1692$

$= 72$ ∴ 2 zeros

or

Vertex (7,6) & opens down ∴ 2 zeros



4. For the function $f(x) = 2x^2 - 4x + k$, what value(s) of k will have

a) one solution?

b) no solutions?

c) two solutions?

a) $d = 0$

$0 = b^2 - 4ac$

$0 = (-4)^2 - 4(2)k$

$0 = 16 - 8k$

$-16 = -8k$

$k = 2$

b) d is negative

$= (-4)^2 - 4(2)k$

$= 16 - 8k$

$k > 2$

c) d is positive

$16 - 8k$

$k < 2$

THINKING **Level** **1** **2** **3** **4**

* more applications on test

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~~Tutor~~ Tues 3:45 - 500pm

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