MCF3M **Quadratic Functions Practice Test** Name: Solutions

Knowledge	R	Level 1	Level 2	Level 3	Level 4
Able to use the quadratic formula to find zeros.		Limited success	Some success	Considerable success	A high degree of success

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

1. Use the quadratic formula to solve each equation.

a) $x^2 - 2x - 18 = 0$

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(-18)}}{2(1)}$$
$$= \frac{2 \pm \sqrt{4 + 72}}{2}$$
$$= \frac{2 \pm \sqrt{76}}{2}$$
$$\doteq -3.36,\ 5.36$$

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

$$2x^2 + x + 3 = 0$$
$$x = \frac{-1 \pm \sqrt{1^2 - 4(2)(3)}}{2(2)}$$
$$= \frac{-1 \pm \sqrt{-23}}{4}$$

no solution

c) $-3x^2 + 13x + 10 = 0$

$$x = \frac{-13 \pm \sqrt{13^2 - 4(-3)(10)}}{2(-3)}$$
$$= \frac{-13 \pm \sqrt{169 + 120}}{-6}$$
$$= \frac{-13 \pm \sqrt{289}}{-6}$$
$$= \frac{-13 \pm 17}{-6}$$
$$= -\frac{2}{3},\ 5$$

d) $x^2 - 60 = 0$

$$x = \frac{0 \pm \sqrt{0^2 - 4(1)(-60)}}{2(1)}$$
$$= \frac{\pm\sqrt{240}}{2}$$
$$\doteq \pm 7.75$$

Knowledge	R	Level 1	Level 2	Level 3	Level 4
Able to use the discriminant to determine the number of zeros.		Limited success	Some success	Considerable success	A high degree of success

2. Determine the number of zeros of each parabola.

a) $f(x) = x^2 - 6x + 10$

$$(-6)^2 - 4(1)(10)$$
$$= 36 - 40$$
$$= -4$$

no zeros

b) $k(x) = -2x^2 + 5x - 1$

$$5^2 - 4(-2)(-1)$$
$$= 25 - 8$$
$$= 17$$

two zeros

c) $g(x) = 3x^2 + 4x$

$$4^2 - 4(3)(0)$$
$$= 16 - 0$$
$$= 16$$

two zeros

d) $h(x) = x^2 - 8x + 16$

$$(-8)^2 - 4(1)(16)$$
$$= 64 - 64$$
$$= 0$$

one zero

Knowledge	R	Level 1	Level 2	Level 3	Level 4
Able to convert quadratic functions in standard form to vertex form.		Limited success	Some success	Considerable success	A high degree of success

3. Write each function in vertex form.

a) $f(x) = x^2 - 10x + 8$

$= (x^2 - 10x + 25) + 8 - 25$

$= (x-5)^2 - 17$

$\frac{-10}{2} = -5$

$(-5)^2 = 25$

b $k(x) = 2x^2 + 24x - 5$

$= 2(x^2 + 12x + 36) - 5 - 72$

$= 2(x+6)^2 - 77$

$\frac{12}{2} = 6$

$6^2 = 36$

c) $g(x) = -3x^2 + 18x - 4$

$= -3(x^2 - 6x + 9) - 4 + 27$

$= -3(x-3)^2 + 23$

$\frac{-6}{2} = -3$

$(-3)^2 = 9$

d) $h(x) = x^2 - 3x + 1$

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

$= (x - \frac{3}{2})^2 - \frac{5}{4}$

$(\frac{-3}{2})^2 = \frac{9}{4}$

4. State the vertex of each function in question 3.

a) $(5, -17)$ b) $(-6, -77)$ c) $(3, 23)$ d) $(\frac{3}{2}, -\frac{5}{4})$

Communication	R	Level 1	Level 2	Level 3	Level 4
Use of vocabulary		Uses vocabulary with limited effectiveness	Uses vocabulary with some effectiveness	Uses vocabulary with considerable effectiveness	Uses vocabulary with a high degree of effectiveness

5. Explain how you would determine the number of zeros of the following quadratic functions.

a) $ax^2 + bx + c = 0$

- if $b^2-4ac > 0$ then 2 zeros
- if $b^2-4ac = 0$ then 1 zero
- if $b^2-4ac < 0$ then no zeros

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

- if a and k have the same sign then no zeros
- if $k=0$ then 1 zero
- if a and k have opposite signs then 2 zeros

Application	R	Level 1	Level 2	Level 3	Level 4
Sketch graph of quadratic function in standard form.		Solution has minor errors. Sketch corresponds to errors. At least one of domain and range corresponds to solution.	Minor error results in incorrect identification of vertex. Graph corresponds to the error. Domain and range correspond to the error.	Vertex is identified accurately and graph is plotted accurately. Domain and range are correct.	Vertex is identified accurately and graph is plotted accurately. Another point is identified accurately on the sketch. Domain and range are correct.

6. Find the domain and range of the quadratic function $f(x) = x^2 - 6x + 4$. Graph the function below.

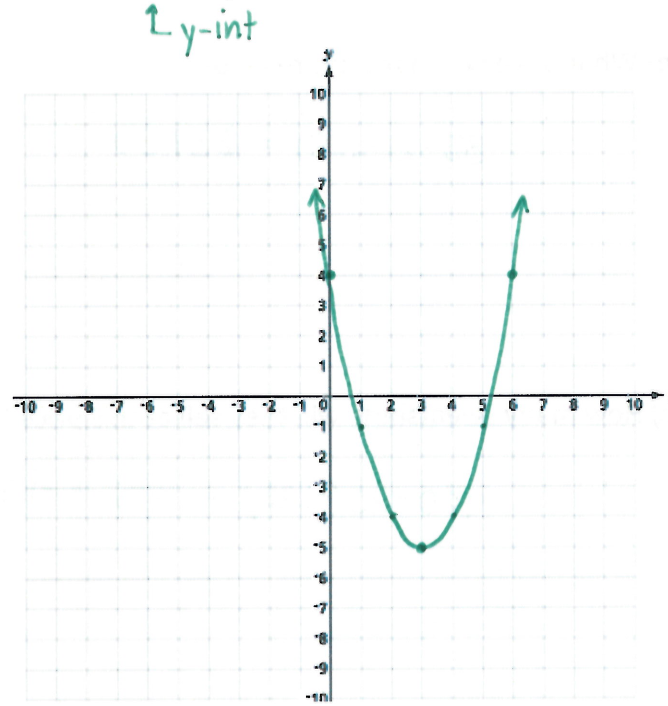
$f(x) = (x^2 - 6x + 9) + 4 - 9$ $\quad \frac{-6}{2} = -3$

$= (x-3)^2 - 5$ $\quad (-3)^2 = 9$

↳ vertex: $(3,-5)$

D: $\{x \in \mathbb{R}\}$

R: $\{y \in \mathbb{R} \mid y \geq -5\}$



TIPS	R	Level 1	Level 2	Level 3	Level 4
Solves problems involving quadratic functions.		Applies the problem solving process with limited skill.	Applies the problem solving process with some skill.	Applies the problem solving process with considerable skill.	Applies the problem solving process with great skill.

7. The School Council sells sweatshirts to raise funds. The students sell 400 sweatshirts a year at a cost of $35 each. They are planning to change the price to generate more revenue. A survey shows that for every $2 price decrease, they can sell an additional 20 sweatshirts.

a) What is the maximum revenue they can generate?

Revenue = price X # sold

$= (35-2n)(400+20n)$

Method 1:

$R = (35-2n)(400+20n)$

$= 14000 + 700n - 800n - 40n^2$

$= -40n^2 - 100n + 14000$

$= -40(n^2 + 2.5n + 1.5625) + 14000 + 62.5$

$= -40(n+1.25)^2 + 14062.5$

The maximum revenue is $14062.50.

Method 2:

$R = (35-2n)(400+20n)$

$35-2n=0$

$35=2n$

$\frac{35}{2}=n$

$17.5=n$

$400+20n=0$

$20n=-400$

$n=-20$

$\frac{17.5-20}{2} = -1.25$

$R = (35-2(-1.25))(400+20(-1.25))$

$= 14062.5$

The maximum revenue is $14062.50.

b) What price will maximize revenue?

$35-2(-1.25) = \$37.50$

c) How many sweatshirts will they sell at this price?

$400+20(-1.25) = 375$ t-shirts