Unit 4 Test 1 : Quadratics Review

NAME: **Answer key**

1. **Factor the following Quadratic Expressions:**

A) $x^2 + 7x + 10$

$(x+5)(x+2)$

B) $7x^2 - 14x + 7$

$7(x-1)(x-1)$
$7(x-1)^2$

C) $7x^2 + 15x + 2$

$7x^2 + 14x + 1x + 2$
$7x(x+2) + 1(x+2)$
$(7x+1)(x+2)$

$14 < \begin{smallmatrix}14\\1\end{smallmatrix}$

D) $15x^2 + 4x - 3$

$(5x+3)(3x-1)$

E) $6x^3 - 16x^2 + 21x - 56$

$(2x^2+7)(3x-8)$

2. The height that the soccer ball traveled is described by the following quadratic function. The soccer ball traveled by the path: $f(x) = -16x^2 + 40x + 2$. (Calculator Allowed)

a) How high did the ball reach? 27 ft

b) At what time did the ball reach the maximum height? 1.25 sec

c) At what time does the ball hit the ground? 2.55 sec

d) What was the height of the ball after .5 seconds? 18 sec

e) How long is the soccer ball higher than 20 ft? 1.32 sec

$\begin{array}{r}1.91\\-.59\\\hline .6\end{array}$

3) Describe the transformation(s) from the parent function $y = x^2$ for each of the following. Then state the Domain and Range.

a) $y = -(x - 2)^2 - 7$

• reflection over x-axis
• shift right 2
• shift down 7

$D:(-\infty,\infty)$ $R:(-7,\infty)$

b) $y = 4(x + 3)^2 + 4$

• shift up 4
• shift left 3
• V. stretch by 4

$D:(-\infty,\infty)$ $R:(4,\infty)$

c) $y = \frac{1}{3}(x)^2$

• vertical compression by $\frac{1}{3}$

$D:(-\infty,\infty)$.
$R:(0,\infty)$

4) Given the following transformations to the parent function, $y = x^2$, write the equation:

Vertical Stretch by a factor of 3, left 4, down 7.

$y = 3(x+4)^2 - 7$

5) Convert the following functions

a. Standard form to Vertex Form: $y = 6x + 3x^2$

$y = 3x^2 + 6x$

$X = \frac{-b}{2a}$ $X = \frac{-6}{3(2)}$ $X = -1$

$y = 3(-1)^2 + 6(-1)$
$y = 3 - 6$

$(-1,-3)$

$\boxed{y = 3(x+1)^2 - 3}$

b. Vertex form to Standard Form: $y = -2(x - 4)^2 + 1$

$y = -2(x-4)(x-4) + 1$
$y = -2(x^2 - 8x + 16) + 1$
$y = -2x^2 + 16x - 32 + 1$

$\boxed{y = -2x^2 + 16x - 31}$

6) Find the following for the function: $y = 3x^2 - 4x - 4$

a) Vertex

$\left(\frac{2}{3}, -\frac{16}{3}\right)$

b) y-intercept

$(0, -4)$

c) Axis of symmetry

$x = \frac{-b}{2a}$ $X = \frac{4}{2(3)} = \frac{4}{6}$ $\boxed{X = \frac{2}{3}}$

7) Given the following function $y = 4(x-2)^2 + 3$ $^{+U}$ $^{+5}$

      a) Transform up 5 units and left 6 units. What is the new equation? $\boxed{y = 4(x+4)^2 + 8}$

original $\Big\{$

      b) Find the y-intercept. $y = 4(0-2)^2 + 3$

      c) Find the vertex. $y = 4(4) + 3$ $\boxed{(0,19)}$

$\boxed{(2,3)}$ $\qquad y = 19$

8) Perform the following Polynomial Operations. Write your answer in Standard Form.

    a) $(x+5)^2 - 8$ → $(x+5)(x+5) - 8$

$\qquad x^2 + 5x + 5x + 25 - 8$

$\qquad \boxed{x^2 + 10x + 17}$

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

$5x + x^4 - 3x^4 - 4x \longrightarrow x - 2x^4 \rightarrow \boxed{-2x^4 + x}$

9) The following table give the average cost, to the nearest hundred, of a new 4-door sedan. (Calculator Allowed)

$x = $ years after 1990

Year	Value
1 1991	$12,800
4 1994	$15,500
7 1997	$19,200
10 2000	$24,300
13 2003	$30,100

    a. Use this information to construct a quadratic regression to represent the model, rounding all constants to 3 decimal places.

$- \quad y = 60.317x^2 + 602.222x + 12123.175$

    b. Using this regression model, estimate during which year the average cost of a new 4-door sedan reached 37,000.

$x = 15.9 \qquad y = \boxed{2005}$

    c. Using the regression model, find the value of a new 4-door sedan in 2016.

$x = 26$

$\boxed{\$68555.56}$