Name:_____ Date:_____

Math 10 Honours Review # 1 Quadratic Functions: 1.1 to 1.3

1. Convert each equation in to vertex form: $y = a(x-p)^2 + q$ by completing the square. Then indicate the coordinates of the vertex, x-intercepts, y-intercepts, domain and range. Show all your steps:

a) $y = x^2 + 4x - 20$ *Equation*:	b) $y = -x^2 - 14x - 15$ *Equation*:
c) $y = 4x^2 + 20x - 12$ *Equation*:	d) $y = -2x^2 - 15x + 100$ *Equation*:
e) $y = -\frac{1}{2}x^2 + 14x + 100$ *Equation*:	f) $y = -\frac{3}{2}x^2 - 8x + 30$ *Equation*:

2. Given a quadratic function in the form of $y = a(x-p)^2 + q$:
   a. If $a > 0$ and $q > 0$, then the function will not have any roots: TRUE or FALLSE (Explain)
   b. If $a < 0$ and $q > 0$, then the function will have only one root: TRUE or FALLSE (Explain)
   c. If $a < 0$ and $p < 0$, then the function will at least one root: TRUE or FALLSE (Explain)
   d. If $a \times q < 0$ then the function will have two roots: TRUE or FALLSE (Explain
3. A rocket is shot into the sky and the height of the rocket is given by the equation: $h(t) = -5t^2 + 12t + 10$ where "t" is the number of seconds after the rocket was launched.
   a. What is the height when the rocket hits the ground?

   b. At what time does the rocket hit the ground?

   c. After how many seconds will the rocket be at a height of 30meters?

   d. What is the domain and range of the function h(t)

4. The height of a football (h) tossed by a quarterback is given by the equation $h = -4.9t^2 + 19t + 1.4$, where "t" is the numbers of seconds after the ball is tossed.
   a) Find the time when the ball is falling 10 meters above the ground

   b) What is the domain and range of this function?

5. A pebble is thrown from a bridge into a river at height "h" meters above the river. Let "t" be the number of seconds after the release. If the height of the pebble is given by the equation: $h(t) = -4.9t^2 + 10t + 65$, then:
   a) How high is the pebble after 3.5 seconds?

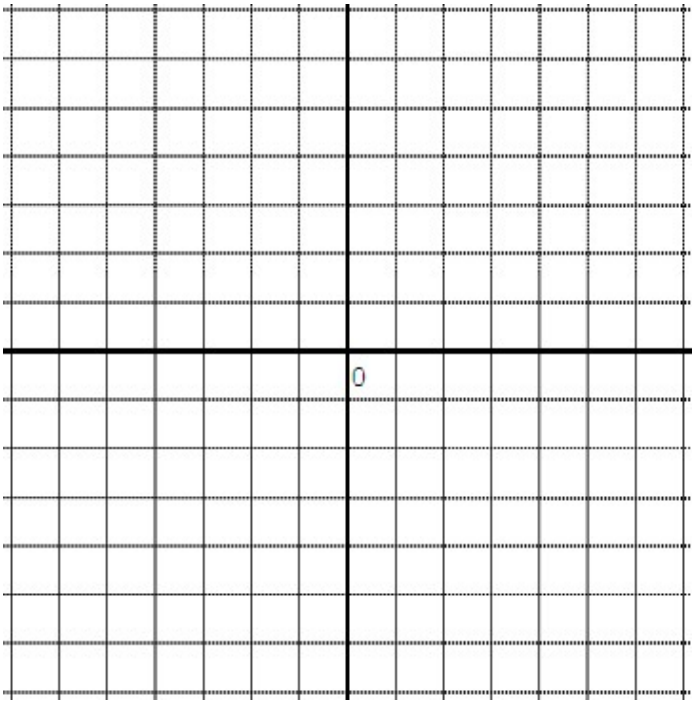
   b) What is the vertex of the equation? What does the vertex represent?

   c) What is the domain and range of this scenario and what does it represent?

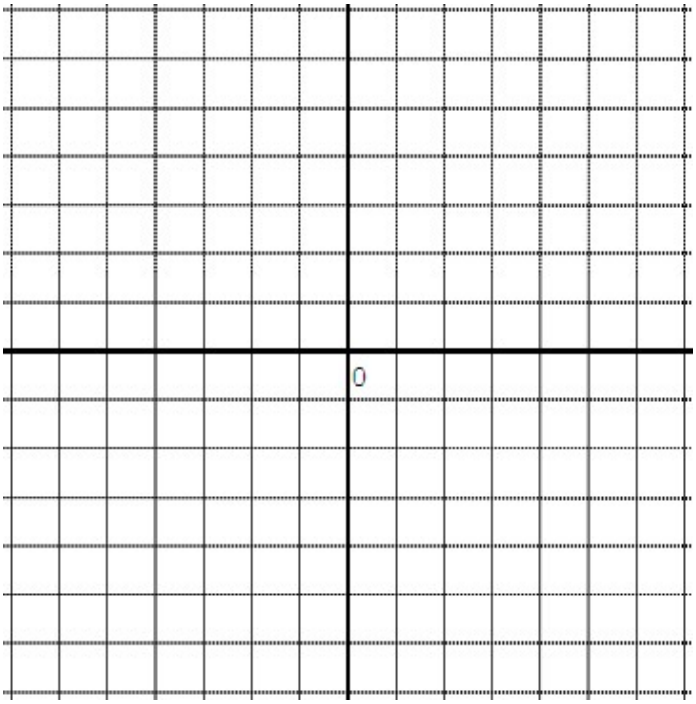
   d) For how many seconds will the pebble be above 68meters? (Give exact values)

6. Graph each of the following quadratic functions and label the following: Equation of the Axis of Symmetry, Coordinates of the Vertex, and coordinates of the X and Y-intercepts. Also state the domain and range:

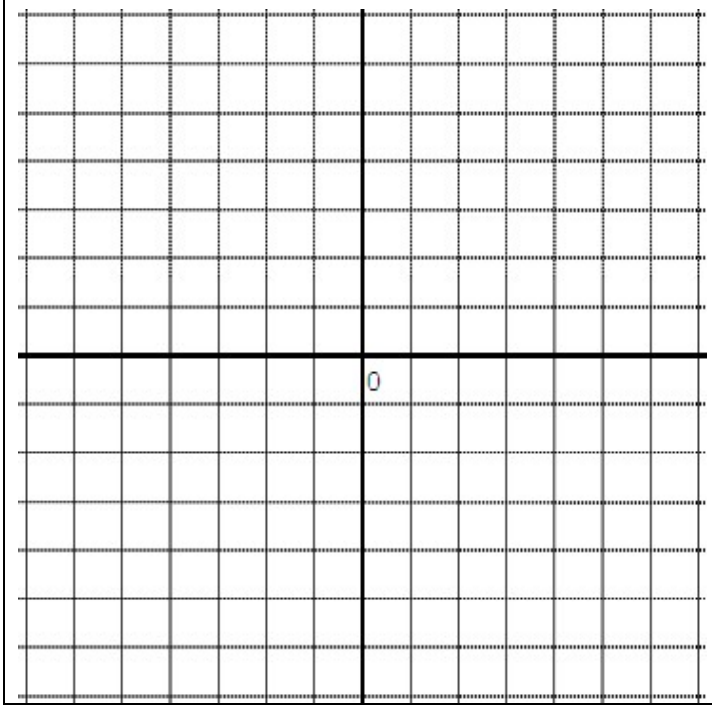
a) Equation: $y=(x-4)^2-5$



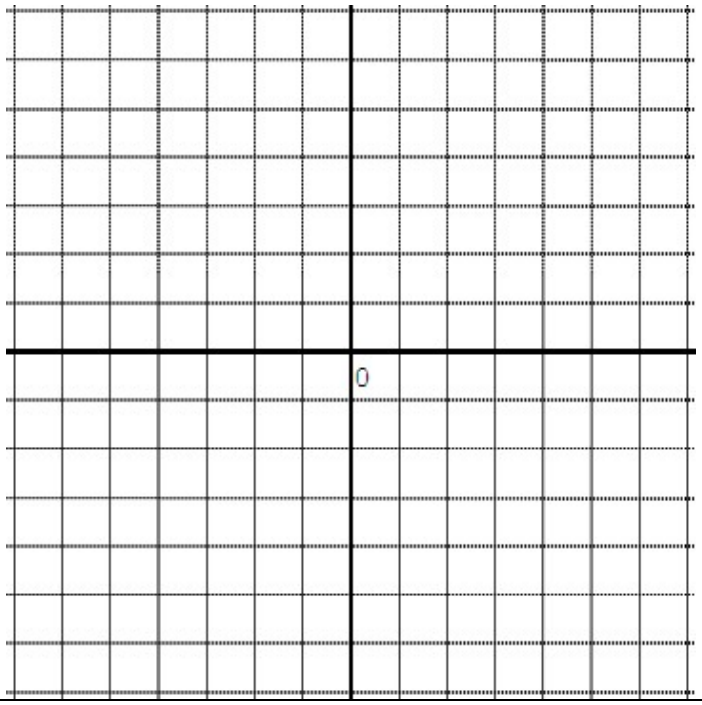
b) Equation: $y=-(x+3)^2+6$



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



d) Equation: $y=-\frac{1}{2}(x-2)^2+7$

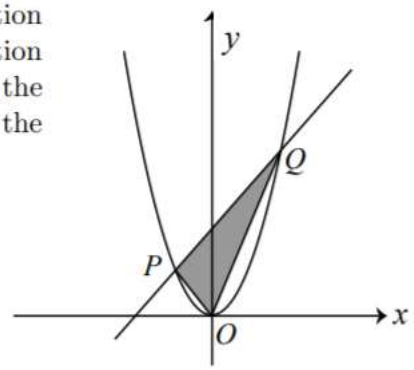


Challenge Problems on Quadratic Functions:

If x and y are real numbers, the minimum possible value of the expression $(x+3)^2+2(y-2)^2+4(x-7)^2+(y+4)^2$ is

(A) 172 **(B)** 65 **(C)** 136 **(D)** 152 **(E)** 104

Suppose that $k > 0$ and that the line with equation $y = 3kx + 4k^2$ intersects the parabola with equation $y = x^2$ at points P and Q, as shown. If O is the origin and the area of $\triangle OPQ$ is 80, then the slope of the line is



(A) 4 **(B)** 3 **(C)** $\frac{15}{4}$

(D) 6 **(E)** $\frac{21}{4}$

Consider the quadratic equation $x^2-(r+7)x+r+87=0$ where r is a real number. This equation has two distinct real solutions x which are both negative exactly when $p < r < q$, for some real numbers p and q. The value of p^2+q^2 is

(A) 7618 **(B)** 698 **(C)** 1738 **(D)** 7508 **(E)** 8098

Points $P(r,s)$ and $Q(t,u)$ are on the parabola with equation $y = x^2 - \frac{1}{5}mx + \frac{1}{5}n$ so that $PQ = 13$ and the slope of PQ is $\frac{12}{5}$. For how many pairs (m,n) of positive integers with $n \leq 1000$ is $r+s+t+u = 27$?

(A) 28 **(B)** 26 **(C)** 27 **(D)** 29 **(E)** 25

How many quadratic polynomials with real coefficients are there such that the set of roots equals the set of coefficients? (For clarification: If the polynomial is $ax^2+bx+c, a \neq 0$, and the roots are r and s, then the requirement is that $\{a,b,c\} = \{r,s\}$.)

(A) 3 **(B)** 4 **(C)** 5 **(D)** 6 **(E)** infinitely many