Name:_____ **Date:**_____

M10 Honours: Section 2.4 Deriving Quadratic Equations

1. Derive a quadratic equation for each parabola with the given information:

a) Vertex $(0,2)$ with point P $(-3,11)$	b) Vertex $(5,2)$ with point P $(3,-10)$	c) Vertex $(4,-3)$ with point P $(6,5)$
d)Vertex $(0,2)$ opens down, and is congruent to $y=\frac{1}{3}x^2$	e) Vertex $(0,2)$ opens up, and is congruent to $y=0.25x^2$	f) X-intercepts at 3 & -4, opens down, and is congruent to $y=\frac{1}{2}x^2$
g) Roots at $3\&-6$ with point P $(2,12)$ on the parabola	h) Roots at $-\frac{7}{4}\&-\frac{3}{2}$ with point P $(3,8)$ on the parabola	i) Roots at $10\&-\frac{5}{6}$ with point P $(5,10)$ on the parabola

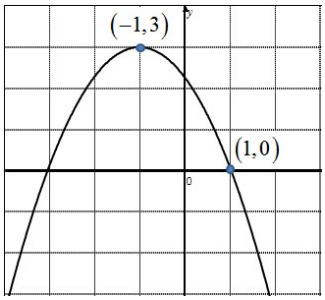
j) 3 Points on the parabola: $(2,6)$, $(4,6)$, and $(5,12)$	k) Maximum at 3, y-intercept at -12, and point $(10,-12)$	l) Axis of Symmetry $x=3$,y-intercept at 4.5, one x-intercept at 7, opens down

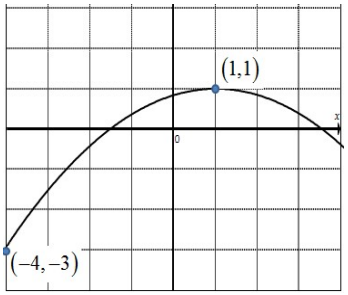
2. Determine the value of the Discriminant and the Nature of the Roots:

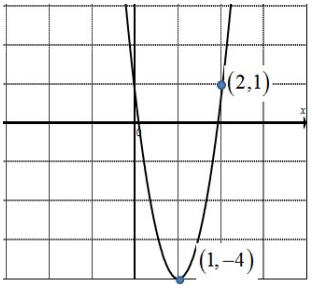
a) $4x^2+10x+9=0$	b) $-x^2+6x+7=0$	c) $-3x^2+\frac{1}{2}x+4=0$
d) $5x^2-3x+\frac{1}{4}=0$	e) $(x+3)^2=1$	f) $\frac{x^2}{-3}=4x$

g) $200+33x+x^2=0$	h) $0=x^2+12x-85$	i) $0=3x^2-12x-288$

3. Derive a quadratic equation in the form of $y=a(x-p)^2+q$ for each of the following graphs:







4. Determine the value(s) of "k" in each equation so that one root is double the other root:

a) $x^2+kx+50=0$ b) $4x^2+kx+4=0$ c) $2x^2-3x+k=0$

5. Determine the value(s) of "k" in each equation so that one root is triple the other:

a) $3x^2-4x+k=0$ b) $4x^2+kx+27=0$ c) $16x^2+kx+27=0$

6. Determine the value(s) of "k" in each equation so that one root is equal to the other:

a) $4x^2 + kx + 25 = 0$ b) $9x^2 - 42x + k = 0$ c) $9x^2 - kx + 1 = 0$

7. For what values of "k" will each equation have either "2 different roots", "2 equal roots", or "no roots"

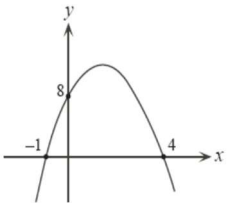
a) $4x^2 + kx + 6 = 0$ (2 Different Roots) b) $6x^2 - 10x + k = 0$ (2equal roots)

c) $(2k+1)x^2 - 3x + 5 = 0$ (No Roots) d) $(5k-1)x^2 - 4kx + 1 = 0$ (2 Distinct Roots)

e) $kx^2 - 5x + 2k = 0$ (2 Equal Roots) f) $(2k-1)x^2 + 3kx + k + 1 = 0$ (2 Distinct Roots)

8. $f(x)$ is a quadratic function with zeroes at $x = 2$ and $x = 4$. $f(0) = 1$, what is $f(-1)$?

9. In the diagram, the parabola has x-intercepts at -1 and 4, with the y-intercept at 8. If the parabola passes through the point (3,*w*), what is the value of "*w*"?



10. Let m and n be the roots of the equation $ax^2 + bx + c = 0$. Let $px^2 + qx + r = 0$ be a quadratic equation for which $m+2$ and $n+2$ are roots. If $p = a$, then $q + r$, expressed in terms of a, b, and c is:

a) $c + 3b$ b) $c - b$ c) $c + 3b + 8a$ d) $c - b + 4a$ e) $c - b + 8a$

11. Both roots of the quadratic equation $x^2 - 63x + k = 0$ are prime numbers. What is the number of possible values for the constant "k":

a) 0 b) 1 c) 2 d) 4 e) more than four

12. A grid point in the place is a point (x, y) for which both x and y are integers. The number of grid points that lie within or on the boundary of the region bounded by the parabola $y = x^2$ and the line $y = 50$ is:

a) 470 b) 485 c) 490 d) 750 e) 765

13. What value(s) of k will make the following to be factored as the square of a linear polynomial?

$4x^2 + kx + 49$

14. For what values of k does the equation $5x^2 + kx + 5 = 0$ have two different real roots?

a) $-10 < k < 10$ b) $k < -10, k > 10$ c) $k \pm 10$ d) $k > 10$

15. One root of $x^2 - kx + 18 = 0$ is twice the other. Then $k = ?$

16. The quadratic equation $x^2 + mx + n = 0$ has roots that are twice those of $x^2 + px + m = 0$, and none of m, n, and p is zero. What is the value of n / p ?

a) 1 b) 2 c) 4 d) 8 e) 16

17. For how many integers k do the parabolas with equations $y = -\frac{1}{8}x^2 + 4$ and $y = x^2 - k$ intersect on or above the x-axis?

a) 9 b) 32 c) 33 d) 36 e) 37

18. Determine the one value of "x" such that $x - \sqrt{4x + 12} = 0$. Justify your answer

19. Challenge: COMC 2015: A quadratic function in the form of $y = ax^2 + px + q$ has one root that is double the other.

i) If $p = -15$, then what is the value of "q"?

ii) If one of the root is equal to 4, then what are all the possible values of $p + q$?

iii) If the value of $p + q = 9$, then what are all the possible quadratic equations?

20. Challenge: Determine all real values of "c" such that $x^2 - 4x - c - \sqrt{8x^2 - 32x - 8c} = 0$ has precisely two distinct real solutions for "x". [COMC]

21. Let "x" , "y", and "z" be real numbers such that $x + y + z = 3$ and $xy + yz + xz = a$, where "a" is a real parameter. Determine the value of the parameter "a" for which the difference between the maximum and the minimum possible values of "x" equals 8. (COMC POW)