



Functions 3: Using the discriminant

Name.....

(1) State the number of solutions for the following quadratics.

(a) $0 = x^2 + 8x + 4$

$b^2 - 4ac = 48 > 0$. 2 sols.

(b) $0 = x^2 - 2x + 10$

$b^2 - 4ac = -36 < 0$. 0 real sols.

(c) $0 = x^2 + 12x + 36$

$b^2 - 4ac = 0$. 1 distinct sol.

(2) For what value(s) of a , b and c do the following quadratics have 1 repeated root?

$b^2 - 4ac = 0$

(a) $0 = ax^2 + 2x + 4$

(b) $0 = x^2 + bx + 4$

(c) $0 = -3x^2 - 5x + c$

(a) $4 - 16a = 0$

(b) $b^2 - 16 = 0$

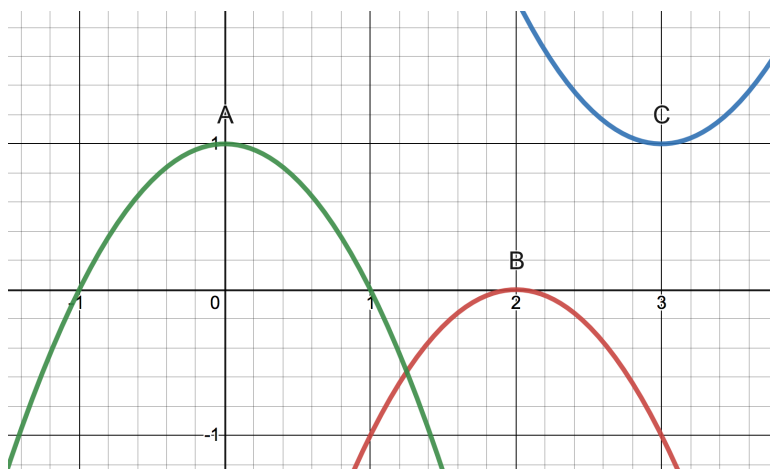
(c) $25 + 12c = 0$

$a = 0.25$

$b = \pm 4$

$c = -\frac{25}{12}$

(3) State the nature of the discriminant for the following 3 graphs:



A: $b^2 - 4ac > 0$

B: $b^2 - 4ac = 0$

C: $b^2 - 4ac < 0$



- (4) For what value(s) of m does the following quadratic have 1 repeated real root?

$$0 = mx^2 + 2mx + 4$$

$$b^2 - 4ac = 0$$

$$4m^2 - 16m = 0$$

$$4m(m - 4) = 0$$

$$m = 0, m = 4$$

(In this case reject $m = 0$ as this does not create a quadratic).

- (5) For what value(s) of m does the following quadratic have 2 real roots?

$$0 = (m + 6)x^2 + 2mx + 2m$$

$$b^2 - 4ac > 0$$

$$4m^2 - 4(m + 6)(2m) > 0$$

$$4m^2 - 8m^2 - 48m > 0$$

$$-4m^2 - 48m > 0$$

$$4m(m + 12) < 0$$

$$-12 < m < 0$$

- (6) For what value(s) of m does the following quadratic have no real roots?

$$0 = (3m + 4)x^2 + mx - 0.5$$

$$b^2 - 4ac < 0$$

$$m^2 - 4(3m + 4)(-0.5) < 0$$

$$m^2 + 6m + 8 < 0$$

$$(m + 4)(m + 2) < 0$$

$$-4 < m < -2$$



- (7) For what value(s) of m does the following quadratic have 1 repeated real root?

$$0 = (m + 1)x^2 + mx + m$$

$$b^2 - 4ac = 0$$

$$m^2 - 4(m + 1)m = 0$$

$$-3m^2 - 4m = 0$$

$$-m(3m + 4) = 0$$

$$m = 0, m = -\frac{4}{3}$$

- (8) For what value(s) of m does the following quadratics have 2 real roots?

$$0 = (2m + 1)x^2 + 2mx - 1$$

$$b^2 - 4ac > 0$$

$$4m^2 - 4(2m + 1)(-1) > 0$$

$$4m^2 + 8m + 4 > 0$$

$$m^2 + 2m + 1 > 0$$

$$(m + 1)(m + 1) > 0$$

This is true for $m \in \mathbb{R}, m \neq -1$

- (9) For what values of m is the line $y = mx - 1$ a tangent to the curve $y = x^2 + 2x$?

$$b^2 - 4ac = 0$$

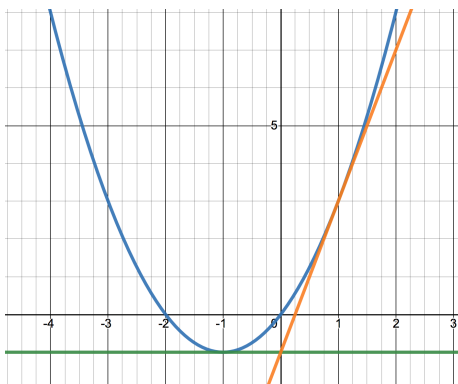
$$mx - 1 = x^2 + 2x$$

$$0 = x^2 + (2 - m)x + 1$$

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

$$2 - m = \pm 2$$

$$m = 0, m = 4$$



- (10) Given that the graphs of $f(x) = x^2 - 3$ and $g(x) = 2x - k$ do not intersect, find k .

$$b^2 - 4ac < 0$$

$$x^2 - 3 = 2x - k$$

$$x^2 - 2x - 3 + k = 0$$

$$4 - 4(-3 + k) < 0$$

$$16 - 4k < 0$$

$$4 < k$$

