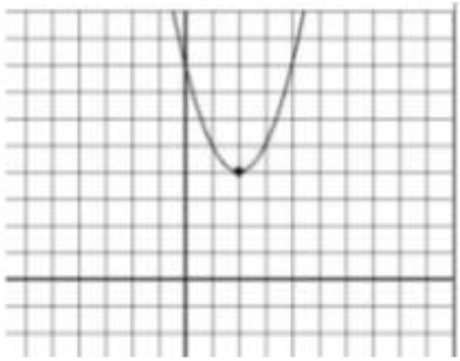
The Discriminant: $b^2 - 4ac$

Given the graphs below determine:

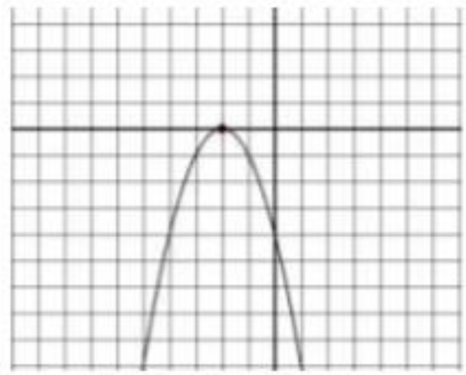
a. is the discriminant > 0, < 0, or = 0
b. the number of roots (solutions)
c. are the roots real or imaginary

1.



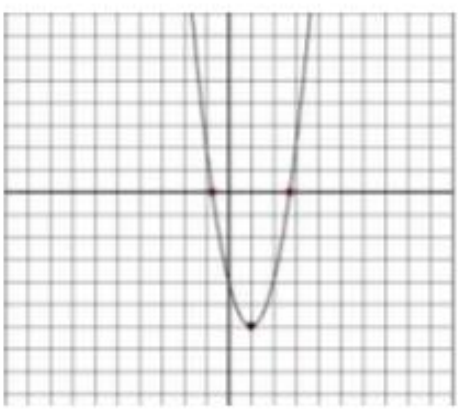
Discriminant < 0
No real roots (Imaginary)

2.



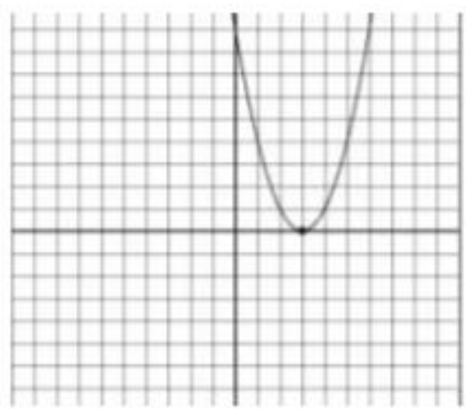
Discriminant = 0
One real root

3.



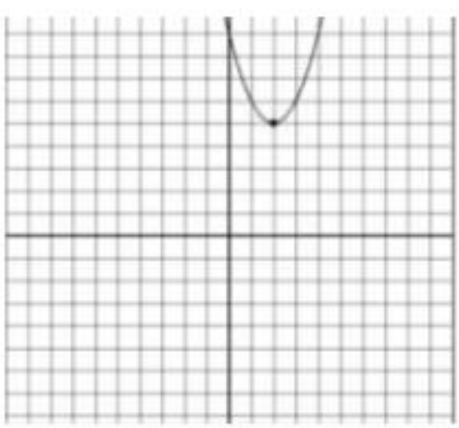
Discriminant > 0
Two real roots

4.



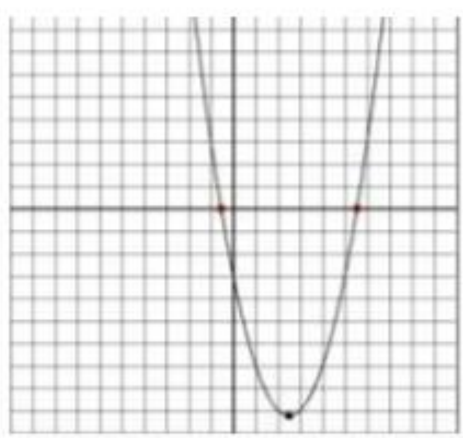
Discriminant = 0
One real root

5.



Discriminant < 0
No real roots (Imaginary)

6.



Discriminant > 0
Two real roots

Find the discriminant to determine the number and nature of the roots of the equation.

7. $x^2 + 6x + 4 = 0$ **Discriminant = 20**
Two real roots

8. $x^2 - 5x - 34 = 0$ **Discriminant = 161**
Two real roots

9. $2x^2 - 3x + 2 = 0$ **Discriminant = -7**
No real roots (Imaginary)

10. $3x^2 - 6x + 2 = 0$ **Discriminant = 12**
Two real roots

11. $3x + 7 = -5x^2 - 4$ **Discriminant = -211**
No real roots (Imaginary)

12. $-3x^2 + 17x - 2 = 3$ **Discriminant = 229**
Two real roots

13. $25x^2 - 15x - 64 = 5x - 10$ **Discriminant = 5800**
Two real roots

Find the discriminant to determine the number of x-intercepts of the function.

14. $f(x) = 3x^2 - 4x + 2$ **Discriminant = -8**
No x-intercepts

15. $f(x) = -2x^2 + 6x - 8$ **Discriminant = -28**
No x-intercepts

16. $f(x) = x^2 - 7x + 7$ **Discriminant = 21**
Two x-intercepts

17. $f(x) = 9x^2 + 24x + 16$ **Discriminant = 0**
One x-intercept

18. $f(x) = x^2 - 3x + 4$ **Discriminant = -7**
No x-intercepts

19. $f(x) = -x^2 - 4$ **Discriminant = -16**
No x-intercepts

20. $f(x) = 4x^2 - 28x + 49$ **Discriminant = 0**
One x-intercept

Take it a step further!

21, Find all the values of a such that $ax^2 + 3x + 5 = 0$ has two real roots.

$a < \frac{9}{20}$

22. Find all the values of a such that $ax^2 + 48x + 64 = 0$ has one real root (a double root).

$a = 9$

23. Find all the values of a such that $ax^2 + 3x - 6 = 0$ has two imaginary roots.

$a < \frac{-3}{8}$

24. Find all the values of c such that $2x^2 - 6x + c = 0$ has two imaginary roots.

$c > \frac{9}{2}$

25. Find all the values of c such $-4x^2 + 8x + c = 0$ that two has real roots.

$c > -4$

26. Assuming , $b \neq 0$, does the sign of b affect the value of the discriminant?
The sign of “b” does not affect the value of the discriminant because the “b” is squared.

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

$$3^2 - 4a(5) > 0$$
$$9 - 20a > 0$$
$$+20a \quad +20a$$
$$9 > 20a$$
$$\frac{9}{20} > \frac{20a}{20}$$
$$\frac{9}{20} > a$$

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

$$48^2 - 4a(64) = 0$$
$$2304 - 256a = 0$$
$$+256a \quad +256a$$
$$2304 = 256a$$
$$\frac{2304}{256} = \frac{256a}{256}$$
$$9 = a$$

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

$$3^2 - 4a(-6) < 0$$
$$9 + 24a < 0$$
$$-9 \quad -9$$
$$24a < -9$$
$$\frac{24a}{24} < -\frac{9}{24}$$
$$a < -\frac{3}{8}$$

24 $b^2 - 4ac < 0$

$$(-6)^2 - 4 \cdot 2c < 0$$
$$36 - 8c < 0$$
$$+8c \quad +8c$$
$$36 < 8c$$
$$\frac{36}{8} < \frac{8c}{8}$$
$$\frac{9}{2} < c$$

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

$$8^2 - 4(-4)c > 0$$
$$64 + 16c > 0$$
$$-64 \quad -64$$
$$16c > -64$$
$$\frac{16c}{16} > -\frac{64}{16}$$
$$c > -4$$