

Pre-Calculus 11 - VLN

Chapter 3: Quadratic Equations

Lesson 5: The Discriminant

Question #1

Reference Q.11114

For the following equation, solve using the quadratic formula and find the number of real roots, draw the graph, and determine the discriminant's polarity (positive or negative): $3x^2 - x - 1 = 0$.

Question #2

Reference Q.11115

For the following equation, solve using the quadratic formula and find the number of real roots, draw the graph, and determine the discriminant's polarity (Positive or negative)

$$2x^2 - 5x - 9 = 0.$$

Question #3

Reference Q.11116

For the following equation, solve using the quadratic formula and find the number of real roots, draw the graph, and determine the discriminant's polarity (positive or negative) :

$$x^2 - 7x + 14 = 0$$

Question #4

Reference Q.11117

Using only the discriminant, state how many distinct real roots the following quadratic equation has:

$$y = 2x^2 + 7x + 17$$

Question #5

Reference Q.11118

Using only the discriminant, state how many distinct real roots the following quadratic equation has:

$$y = x^2 + 23x + \frac{529}{4}$$

Question #6

Reference Q.11119

Using only the discriminant, state how many distinct real roots the following quadratic equation has:

$$y = 2x^2 - 20x + 11$$

Question #7

Reference Q.13758

Find the value of the discriminant in each of the following equations.

a. $x^2 + x + 9 = 0$

b. $3x^2 - 18x + 27 = 0$

Question #8

Reference Q.13766

The discriminant for the quadratic equation $3x^2 - 8 - 7x = 0$ is ____.

Question #9

Reference Q.13759

Determine the nature of the roots of the following equations without solving or graphing.

a. $2x^2 + 4x + 8 = 0$

b. $9x^2 - 24x + 16 = 0$

c. $-2x^2 - x + 3 = 0$

d. $-2(x + 3)^2 + 40 = 0$

e. $x^2 + 10 + 3x = 0$

f. $4x^2 + 4x + 1 = 0$

Question #10

Reference Q.13764

Rosa was analyzing the following four functions:

I. $f(x) = x^2 - x - 11$

II. $f(x) = 2x^2 - x + 3$

III. $f(x) = (3x - 1)(x - 2)(x + 3)$

IV. $f(x) = 4x^2 - 12x + 9$

Which of these functions is a quadratic function with real and equal zeros?

- A. I
- B. II
- C. III
- D. IV

Question #11

Reference Q.13765

Rosa was analyzing the following four functions:

- I. $f(x) = x^2 - x - 11$
- II. $f(x) = 2x^2 - x + 3$
- III. $f(x) = (3x - 1)(x - 2)(x + 3)$
- IV. $f(x) = 4x^2 - 12x + 9$

Which of these functions is a quadratic function with no real zeros?

- A. I
- B. II
- C. III
- D. IV

Question #12

Reference Q.13760

- a. Determine for what value(s) of d the quadratic equation $5x^2 - 10x + d = 0$ has:
 - ii. real and distinct roots
 - iii. real and equal roots
 - iv. non-real roots
- b. Determine an integer value of d such that the equation has rational, non-zero roots.

Question #13

Reference Q.13761

For what values of n does each equation have real roots?

- a. $nx^2 - 2x + 1 = 0$
- b. $2x^2 + 20x + n = 0$

Question #14

Reference Q.13762

For what values of a does the equation $ax^2 + (2a - 3)x + a = 0$ have non-real roots?

Question #15

Reference Q.13763

Show that the roots of the equation $x(x - 3) = k^2 - 2$, $k \in \mathbb{R}$, are always real.

Question #16

Reference Q.13774

At a local golf course, on the par 3, eighth hole, Linda used a seven iron to reach the green.

Her golf ball followed the path of a parabola, approximated by the function

$$h(t) = -5t^2 + 25t + 0.05$$

where t is the number of seconds which have elapsed since Linda hit the ball, and $h(t)$ is the height, in metres, of the ball above the ground after t seconds.

- a. Write the function in standard form.
- b. Find the height of the golf ball 2 seconds after the ball is hit.
- c. Find the maximum height reached by the golf ball.
- d. How many seconds did it take for the golf ball to reach its maximum height?
- e. How high, in centimetres, did Linda tee up her golf ball before she hit it?
- f. How long, to the nearest tenth of a second, did it take for the golf ball to hit the ground?

Question #17

Reference Q.13778

A stone is thrown vertically upward at a speed of 22 m/s. Its height, h metres, after t seconds, is given approximately by the function

$$h(t) = 22t - 5t^2.$$

Use this formula to find, to the nearest tenth of a second, when the stone is 15 metres up and explain the double answer.

Question #18

Reference Q.13780

A springboard diver's height, in metres, above the water, is given by the formula $h(t) = -5t^2 + 8t + 4$

where t is the number of seconds which have elapsed since the start of the dive, and $h(t)$ is the height, in metres, of the diver above the water after t seconds.

The time taken, to the nearest tenth of a second, for the diver to enter the water is ____.