Section 1.4 Part b

more

Quadratic Equations

and

Applications

Jan 27-11:01 AM

By completing the square for the equation $ax^2 + bx + c = 0$ we obtain the Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

This formula provides the solutions to a quadratic equation.

Jan 20-11:41 AM

The expression $b^2 - 4ac$

is called the ***DISCRIMINANT***.

The discriminant is useful for knowing the number of solutions to a quadratic equation:

1) Two real solutions if $b^2 - 4ac > 0$
2) One real solution if $b^2 - 4ac = 0$
3) No real solutions if $b^2 - 4ac < 0$

(but two imaginary)

Jan 31-4:50 PM

Using the Discriminant

Find the value of the discriminant for the quadratic equations. Use the value to determine the number of solutions to each equation.

a) $2x^2 + 3x - 7 = 0$

b) $4x^2 - 12x + 9 = 0$

c) $x^2 - 6x + 13 = 0$

Sep 10-11:13 AM

Discriminant: $b^2 - 4ac$

It tells the number and type of solutions to a quadratic equation.

a) $2x^2 + 3x - 7 = 0$

$3^2 - 4(2)(-7) = 65$

Discriminant = 65 > 0, so there are two real solutions.

b) $4x^2 - 12x + 9 = 0$

$(-12)^2 - 4(4)9 = 0$

Discriminant = 0, so there is one real solution.

c) $x^2 - 6x + 13 = 0$

$(-6)^2 - 4(1)(13) = -16$

Discriminant = -16 < 0, so there are two imaginary solutions.

Now, you can understand Mr. Two Pi....

Mr. Two Pi talks about
<A HREF="https://www.youtube.com/watch?v=cjZpGM7veW4">the Quadratic Formula</A>

Sep 10-11:13 AM

Velocity

Velocity is a measure of the speed and direction that an object is moving.

One direction is chosen to be positive.

The opposite direction is negative.

An object which is not moving has velocity zero.

Note: the speed of an object is the absolute value of it's velocity.

An object moving upward away from the earth has positive velocity, and an object moving downward has negative velocity.

The *position equation* is a formula that gives the height(in feet) of a free moving object based on the number of seconds that the object has been in the air.

t = seconds

$$s = -16t^2 + v_0 t + s_0$$

s = height(feet)

s_0 = initial position

v_0 = initial velocity

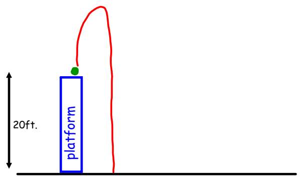
$v_0 < 0$ means the object was projected downward.

$v_0 = 0$ means the object was dropped.

$v_0 > 0$ means the object was projected upward.

Feb 5-3:49 PM

Example: An object is shot upward from a 20ft. platform with an initial velocity of 50ft/s.



a) Write the position equation for the object.

b) How many feet above ground will it be two seconds later?

c) How long will it take until it hits the ground?

FACT: The object will hit ground when $s = 0$.

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Since the object was projected UPWARD, the initial velocity is $v_0 = 50$.

The initial position is $s_0 = 20$.

$$s = -16t^2 + v_0 t + s_0$$

a) $s = -16t^2 + 50t + 20$ The position equation.

b) How many feet above ground will it be two seconds later?

Set $t = 2$.

$$s = -16 \cdot (2)^2 + 50 \cdot 2 + 20 = 56ft$$

c) How long will it take until it hits the ground?

Set the position equation = 0 and solve for t.

$$0 = -16t^2 + 50t + 20$$

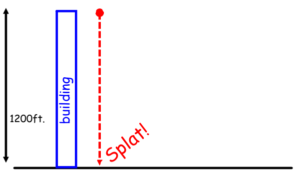
$$t = \frac{-50 \pm \sqrt{50^2 - 4(-16)(20)}}{2(-16)} \approx -0.359, 3.484$$

Discard the negative solution.

Use 3.484 seconds.

Sep 10-10:39 AM

Example: An object is dropped from a 1200ft. building.



a) Write the position equation for the object.

$s = -16t^2 + 1200$

b) How many ft above ground will it be two seconds later?

$s = -16(2)^2 + 1200 = 1136ft.$

c) How long will it take until it hits the ground?

FACT: The object will hit ground when $s = 0$.

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Solve to find the length of time the object remains in the air:

$$16t^2 - 1200 = 0$$

$$16t^2 = 1200$$

$$t^2 = \frac{1200}{16}$$

$$\sqrt{t^2} = \sqrt{\frac{1200}{16}}$$ Extract Square Roots

$$t = \pm\sqrt{\frac{1200}{16}}$$ Discard the negative solution

$$t = \sqrt{(1200 \div 16)} \approx 8.66sec$$

Jan 25-11:50 AM

Example: A rectangular room is three feet longer than it is wide. The area is $154ft^2$.

Find the dimensions of the room.

Area formula for a rectangle.

$A = LW$

$L = w+3$

w

$154 = LW$

$154 = (w+3)w$

$0 = w^2 + 3w - 154$

$0 = (w+14)(w-11)$

$w = -14$

$w = 11$

Discard this solution since a length cannot be negative.

$w = 11$

$L = 14$

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Example: A rectangular room is three times longer than it is wide. The area is $75ft^2$.

Find the dimensions of the room.

$L = 3w$

w

$A = LW$

$75 = LW$

$75 = (3W)W$

$75 = 3W^2$

$\frac{75}{3} = \frac{3W^2}{3}$

$25 = W^2$

$W = 5$

$L = 15$

Sep 6-12:24 PM

The End.

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