8/18/2020

P1 Real Numbers:

Natural #'s
@ Counting #'s : 1, 2, 3, ...

Whole #'s : 0, 1, 2, 3...

Integers: ... -3, -2, -1, 0, 1, 2, 3, ...

Rational #: fraction

Irrational #: have no end

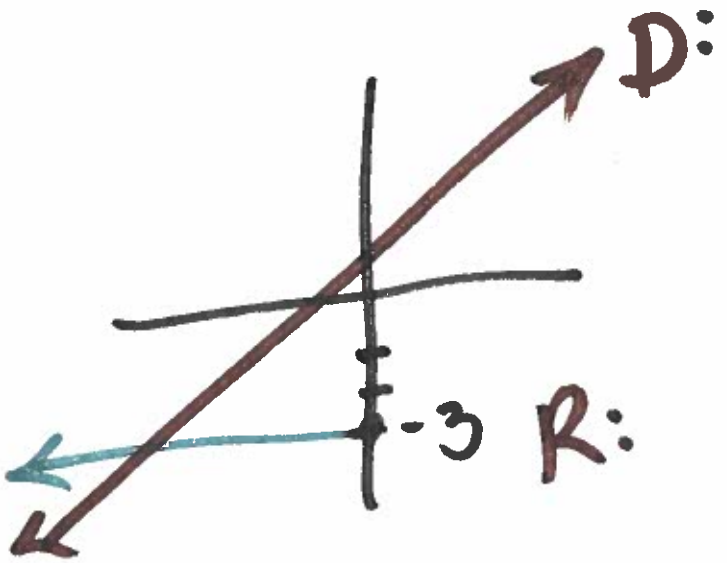
ex π

Set-builder notation: { } [ ]

( ) [ )

all reals

- D: $x = \mathbb{R}$ $(-\infty, \infty)$
- R: $x \leq -3$ $(-\infty, -3]$ ← included



Terminates: ends

Infinitely repeating:

ex. $6.\overline{66}$

Inequalities:

open circle parathesis

- $<$ - less than
- $>$ - greater than

closed circle bracket

- $\leq$ - less than or equal to
- $\geq$ - greater than or equal to

Unbounded intervals:

positive

$+\infty$ - infinitity

$-\infty$ - negative infinity

ie1

$[5, \infty)$

ie2

$(-\infty, 5)$

ie3

$[5, 8)$

Left to right

Additive Inverse: (opposite sign)

ex $5 + (-5) =$ ☺

Multiplicative Inverse: : (reciprocal)

ex $-\frac{1}{2} \cdot \left(\frac{-2}{1}\right) = 1$

Commutative prop: (reverse order)

$a + b = b + a$

Associative Property:

$(a + b) + c = a + (b + c)$

5^{3} → exponent / power / degree

Base

mult. (add powers)

ie1 $2a^3 \cdot 6a^2$ 2 base add

$12a^5$ 1 base (mult.)

ie2 $\left(\frac{x^2}{2}\right)^{-3} = \frac{x^{-6}}{2^{-3}}$

$(x^2)(x^2)(x^2) = x^{-6}$

ie3 $\left(\frac{U^2 \cdot V^3}{V^4 \cdot Z^2}\right)^{-2} = \frac{U^{-4} \cdot V^{-6}}{V^{-8} \cdot Z^{-4}}$

positive powers → $\frac{V^2 \cdot Z^4}{U^4}$

$\frac{V^2 \cdot Z^4}{U^4}$

Addition: (must have same base & power)

ie1 $2a^3 + 6a^3$

$8a^3$

ie2 $2a^2 + 5a^2$

Scientific Notation:

ex $9.300. = 9.300 \times 10^{3}$

New pt. ← 9.300. → old

(new pt. to old point)

ex2 $.0053 = 5.3 \times 10^{-3}$

old pt. ← .0053 → new pt.

(New pt. to old pt.)

ie3 $$\frac{(3.7\times10^{5})(4.5\times10^{9})}{(1.8\times10^{4})}$$

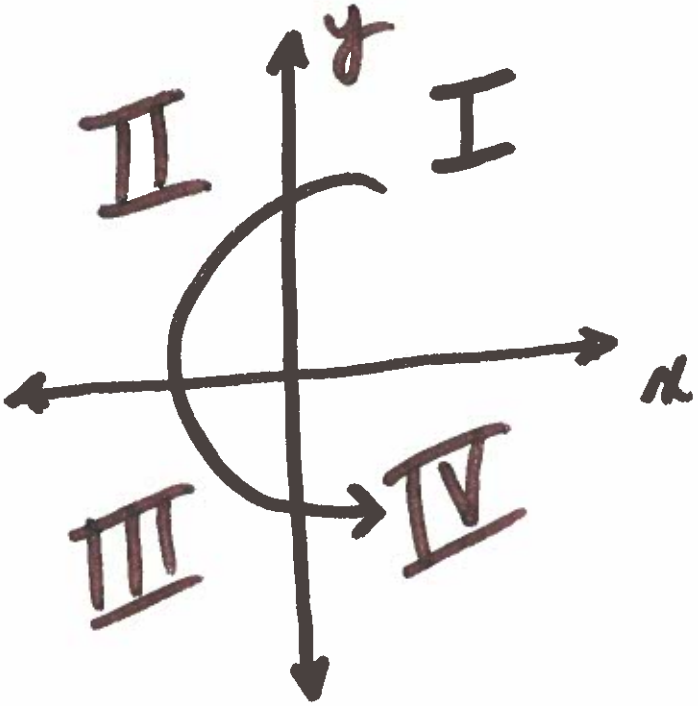
$$= \frac{(3.7\times4.5)}{(1.8)} \cdot \frac{(10^{5}\times10^{9})}{(10^{4})}$$

$$= \frac{16.65}{1.8} \cdot \frac{10^{14} \cdot 10^{10}}{10^{4}}$$

$$= 9.25 \cdot 10^{10}$$

8/19/2020 PRE-CALC.

P2 Cartesian Coordinate System



ordered pair (x, y)

Absolute value: magnitude (size)

ie 1 $|-4| = 4$

ie 2 $|5| = 5$

ie 3 $|x| = 3$

$x = 3$

$x = -3$

#4 $|\pi - 6|$

(+) (−)

$+|\pi - 6|$ $-|\pi - 6|$

$= \pi - 6$ $= -\pi + 6$

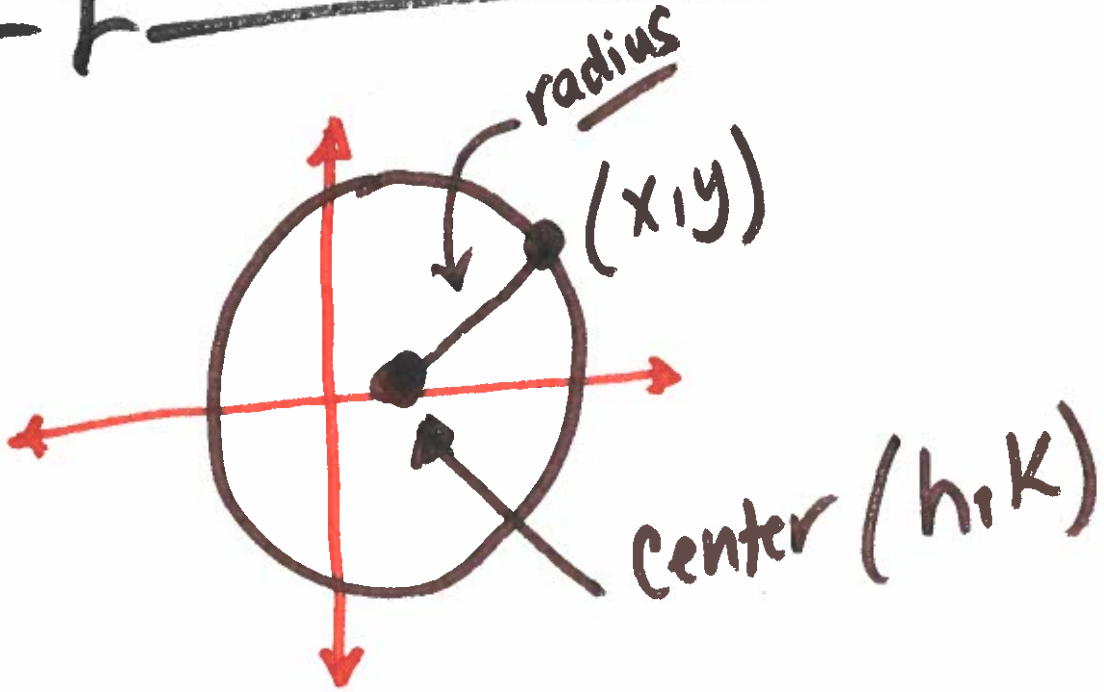
FORMULAS:

Distance: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Pythagorean: $a^2 + b^2 = c^2$

midpoint: $mp = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

Equations of Circles:



distance formula
r - radius

$$r = \sqrt{(x-h)^2 + (y-k)^2}$$

alternative version

$$r^2 = (x-h)^2 + (y-k)^2$$

(equation)

ic1 Center $(\overset{h}{-4}, \overset{k}{1})$ $r = 8$

Find standard form (equation)

FORMULA: $r^2 = (x-h)^2 + (y-k)^2$

$8^2 = (x+4)^2 + (y-1)^2$

$64 = (x+4)^2 + (y-1)^2$

$\sqrt{(x+4)^2 + (y-1)^2} = \sqrt{64}$

$\sqrt{(x+4)^2 + (y-1)^2} = 8$

8/20/2020 Pre-calc.

P3 Linear Equations & inequalities

Reflexive: $u = u$

Symmetric: $u = v$ then $v = u$
(commutative)

Transitive: $u = v$; $v = w$
then $u = w$

Addition: $u = v$; $w = z$
then $u + w = v + z$

Multiplication: $u = v$; $w = z$
then $u \cdot w = v \cdot z$

ic1 $2(2x-3)+3(x+1)=5x+2$

$4x-6+3x+3 = 5x+2$

$7x-3 = 5x+2$
$-5x \quad -5x$

$2x-3 = 2$
$+3 \quad +3$

$\frac{2x}{2} = \frac{5}{2}$

$x = 2.5$

Letter left # right

ie 2

$$-3 < \frac{2x+5}{3} \leq 5$$

divorced (or) x x

thus. AND wife x

$$-9 < 2x+5 \leq 15$$

$$-5 \quad -5 \quad -5$$

$$-14 < 2x \leq 10$$

$$\frac{-14}{2} < \frac{2x}{2} \leq \frac{10}{2}$$

$$-7 < x \leq 5$$

$x > -7$ AND

ic3

$$\left[\frac{x}{3}+\frac{1}{2}>\frac{x}{4}+\frac{1}{3}\right]\frac{12}{1}$$

$$\frac{12x}{3}+\frac{12}{2}>\frac{12x}{4}+\frac{12}{3}$$

$$4x+6>3x+4$$

$-3x \quad -3x$

$$x+6>4$$

$-6 \quad -6$

$$x>-2$$

8/24/2020 Precalculus

P4 Lines in a Plane

Slope-intercept form

$$y = mx \pm B$$

m = slope

B = y-intercept

point-slope fom:

$$y - y_1 = m(x - x_1)$$

(x_1, y_1) point

m = slope

ex 1 $(-3, -4)$ slope 2

$x_1 \quad y_1$

$$y - y_1 = m(x - x_1)$$

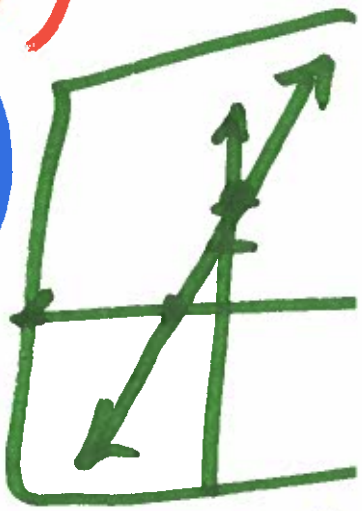
$$y - (-4) = 2(x - (-3))$$

$$y + 4 = 2(x + 3)$$

$$y + 4 = 2x + 6$$

$$-4 \qquad -4$$

$$\boxed{y = 2x + 2}$$



① graph it!

$x_{int} = (-1, 0)$

$y_{int} = (0, 2)$

- **Standard Form:**

$$Ax + By = \pm C$$

- **Vertical line:** ↕ $x = a$
- **Horizontal line:** ↔ $y = b$

- **Parallel Lines**
  same slope
- **Perpendicular Lines**
  reciprocal slope
  with opposite sign

Ex 1 Find an equation of a (same) → parallel line that passes through $P(1,-2)$ given

$$3x - 2y = 1$$

$$-3x \qquad -3x$$

$$-2y = -3x + 1$$

$$\frac{-2y}{-2} = \frac{-3x}{-2} + \frac{1}{-2}$$

$$y = \boxed{\frac{3}{2}}x - \frac{1}{2}$$

2ND equation: $m = \frac{3}{2}$ $(1, -2)$ x_1 y_1

$$y - y_1 = m(x - x_1)$$

$$y - (-2) = \frac{3}{2}(x - 1)$$

$$y + 2 = \frac{3}{2}x - \frac{3}{2}$$

$$y + 2 = \frac{3}{2}x - 1.5$$

$$-2 \qquad -2$$

$$\boxed{y = \frac{3}{2}x - 3.5}$$

#12 $y = \boxed{\frac{3}{2}}x - \frac{1}{2}$

Perp. line passes thro

$P(2, -3)$ (x_1, y_1)

$m = -\frac{2}{3}$

$y - y_1 = m(x - x_1)$

$y - (-3) = -\frac{2}{3}(x - \frac{2}{1})$

$y + 3 = -\frac{2}{3}x + \frac{4}{3}$

$-3 \qquad\qquad -3$

$\left[\frac{4}{3} - \frac{9}{3}\right]$

$y = -\frac{2}{3}x + \left[\frac{4}{3} - \frac{3 \cdot 3}{1 \cdot 3}\right]$

$\boxed{y = -\frac{2}{3}x - \frac{5}{3}}$

8/25/2020 Pre-calc.

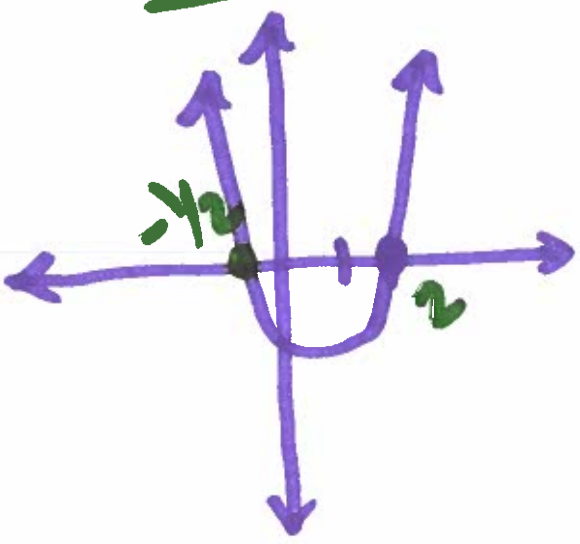
P5 Equations Graphically, Numerically & Algebraically

P1 Finding x-intercepts with factoring . . . →

ex1 $f(x) = 2x^2 - 3x - 2$

(y) $(x + 0.5)(x - 2) = 0$

① Graph it!



x-intercepts $(-0.5, 0)$ $(2, 0)$

2ND calc 2: Value

* Set up curser enter enter
* Set up curser enter

ic 2 $x^2+5x-12 = f(x)$

X-int: $(x+6.772)(x-1.772)$

quad formula

① Graph it!

② find x-int

X-int $(-6.772, 0)$
$(1.772, 0)$

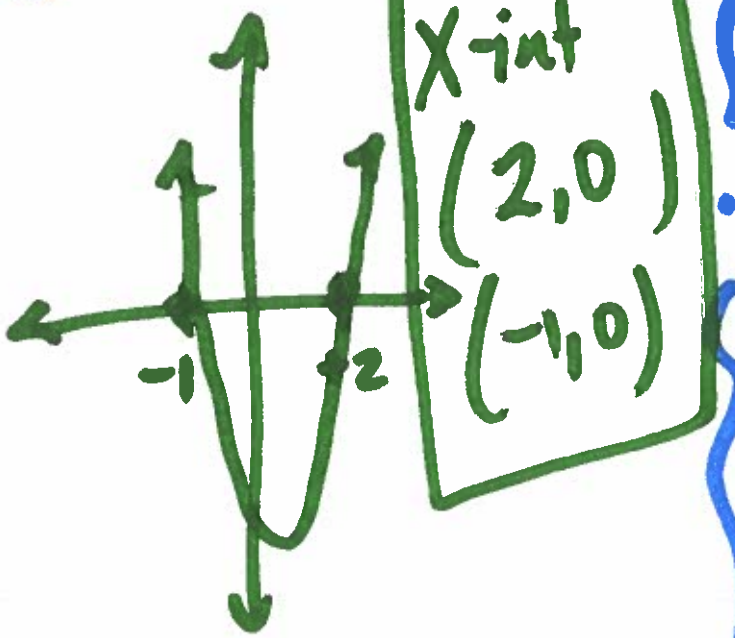
P2 Square Roots

ie 1 $(2x-1)^2 = 9$

Graph it = f(x)

= ☺

$(2x-1)^2 - 9 = ☺$



Long Method

$\sqrt{(2x-1)^2} = \sqrt{9}$

$2x-1 = \pm 3$

$2x-1=3$ $\quad$ $2x-1=-3$

$+1\ +1$ $\quad$ $+1\ +1$

$2x=4$ $\quad$ $2x=-2$

$\frac{2x}{2}=\frac{4}{2}$ $\quad$ $\frac{2x}{2}=\frac{-2}{2}$

$x=2$ $\quad$ $x=-1$

(2,0) $\quad$ (-1,0)

P3 Absolute Value

(find x-intercepts)

ie 1 $|2x-1|=6$

Graph ☺

$|2x-1|=6$

$-6 \quad -6$

$|2x-1|-6=$ ☺

2ND catalog abs

2ND calc 2 enter

enter

enter

X-int (-2.5, 0)

(3.5, 0)

Paper

$|2x-1|=6$

(+) ↙ (−) ↘

$2x-1=6$ $\quad 2x-1=-$

$+1 \quad +1 \quad +1$

$\frac{2x}{2}=\frac{7}{2}$ $\quad \frac{2x}{2}=$

$x=3.5 \quad x=-2.5$

(3.5, 0) & (-2.5, 0)

13.) $x^2+6x+9 = 7+9$

b

$(x+3)(x+3) = 16$

$\left(\frac{6}{2}\right)^2 = 3^2 = 9$

$\sqrt{x+3^2} = \sqrt{16}$

$x+3 = \pm 4$

$-3 \quad -3$

$x = 4-3 = 1$

$x = -4-3 = -7$

x-int

(1, 0)

(-7, 0)

$4x^2 - 20x + 17 = \text{☺}$

$-17 \quad -17$

$4x^2 - 20x + 100 = -17 +$

$4(x^2 - 5x + 20) = 83$

$4(x \quad)(x \quad) = 83$

$-5x$

Precalculus

P6 Complex Numbers

imaginary numbers $i = \sqrt{-1}$

real numbers duh!

Standard form

$$a + bi$$

Adding & Subtra Complex #s

ex) $(7-3i) + (4+5i) = (7+4) + (-3i+5i)$

$= 11 + 2i$

Raising a Complex Number to a Power

(ex 1) If $z = \frac{1}{2} + \frac{\sqrt{3}}{2}i$, find $z^2 : z^3$

z^2

$\left(\frac{1}{2} + \frac{\sqrt{3}}{2}i\right)^2$

$\left(\frac{1}{2} + \frac{\sqrt{3}}{2}i\right)\left(\frac{1}{2} + \frac{\sqrt{3}}{2}i\right)$

$= \frac{-1}{2} + \frac{\sqrt{3}}{2}i$

z^3

$\frac{1}{4} + \frac{2\sqrt{3}}{4}i + \frac{3}{4}(-1)$

$= \left(\frac{-1}{2} + \frac{\sqrt{3}}{2}i\right)\left(\frac{1}{2} + \frac{\sqrt{3}}{2}i\right)^2$

$= -1$

Dividing Complex #'s

(1c1) $\frac{2}{3-i}\frac{(3+i)}{(3+i)}$

$\frac{2(3+i)}{9-i^2}$

$\frac{6+2i}{9-(-1)}$

$\frac{6+2i}{10}$

$= \frac{3}{5} + \frac{1}{5}i$

(1c2) $\frac{5+i}{2-3i}\left(\frac{2+3i}{2+3i}\right)$

$\frac{(5+i)(2+3i)}{4-9i^2}$

$= \frac{10+15i+2i+3i^2}{2^2+3^2}$

$= \frac{7+17i}{13}$

$= \frac{7}{13} + \frac{17}{13}i$

p7 Proving/Solving Inequalities Algebraically & Graphically

Absolute Value $|u|$

Remember Absolute value

$y = |3|$

(+) ↙ (−)

$y = 3$ $\quad$ $y = -3$

ex1 $|x-4| < 8$

(+) ↙ (−) change sign direction use opposite answer

$x - 4 < 8$ $\quad$ $x - 4 > -8$

$+4 \quad +4$ $\quad$ $+4 \quad +4$

$x < 12$ $\quad$ $x > -4$

Ans

$(-4, 12)$

interval notation (not include [include

P2 Quadratics

ie 3

$x^2 - x - 12 \geq 0$

$(x-4)(x+3) \geq 0$

$x = 4$ $\quad x = 4$

$x = -3$ $\quad x = 3$

$x - 4 \geq 0$

$+4 \quad +4$

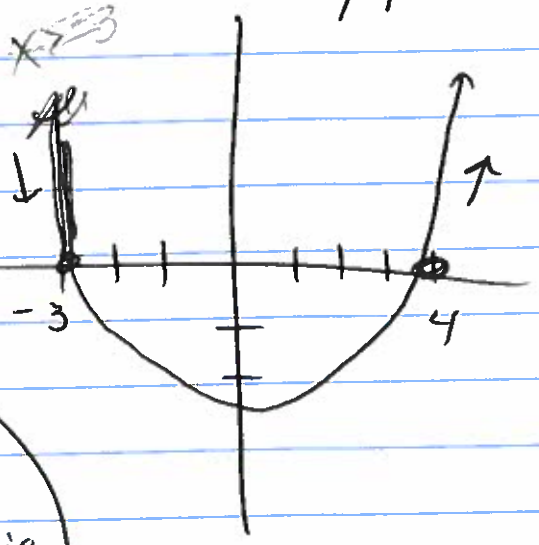
$x \geq 4$

$x + 3 \geq 0$

$-3 \quad -3$

$(-\infty, 3) \cup (4, \infty)$

graph



Since $>$ it is the values about the y-axis

$\geq$

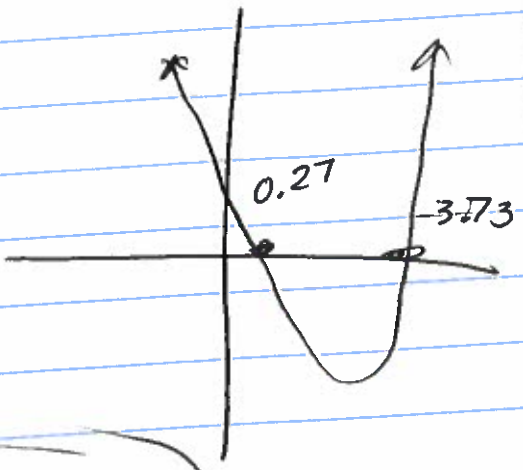
$\leq$

OR

P3 Quadratic Inequality

$x^2 - 4x + 1 \geq 0$

Graph $y = x^2 - 4x + 1$



Since $\geq$ it is an "OK"
(↓ larger than X-axis)

$(-\infty, 0.27] \cup [3.73, \infty)$

(p5) Projectile Motion: movement vertically

$$S = -16t^2 + V_0 t + S_0$$

S_0 = feet above ground

V_0 = feet per second

S = feet

t = seconds

(12) in. velocity: 288 ft.

$S = 1152$ ft

a) $S_0 = 0$

$V_0 = 288$

$$S = -16t^2 + 288t + 0$$

$$1152 = -16t^2 + 288t$$

$$-1152 \qquad -1152$$

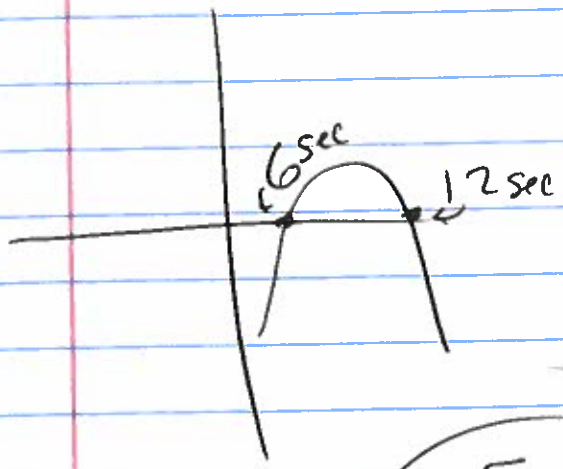
$$0 = \frac{-16t^2}{-16} + \frac{288t}{-16} - \frac{1152}{16}$$

$$0 = t^2 - 18t + 72$$

$$(t - 6)(t - 12)$$

$t = 6$ sec $t = 12$ sec

above ground twice



[6, 12]