October 29, 2025

National Oatmeal Day

Today in History:

Stock Market Crash (1929)

John Glenn returns to Space (1998)

Number of the Day: 869

869 = 11 x 79

869 is the number of different resistances that can be created in a circuit of nine equal resistors.

Fun Fact:

A Michigan law states that a wife's hair legally belongs to her husband.

Quote of the Day:

"Constantly choosing the lesser of two evils is still choosing evil."

- Jerry Garcia

Today's Weather:

Sunny in the morning, clouds in the afternoon, high 57°.

Math 121 - Quiz #31

Sketch a graph of $f(x)$ if:

Vertical asymptotes of $x = -1$ and $x = 1$

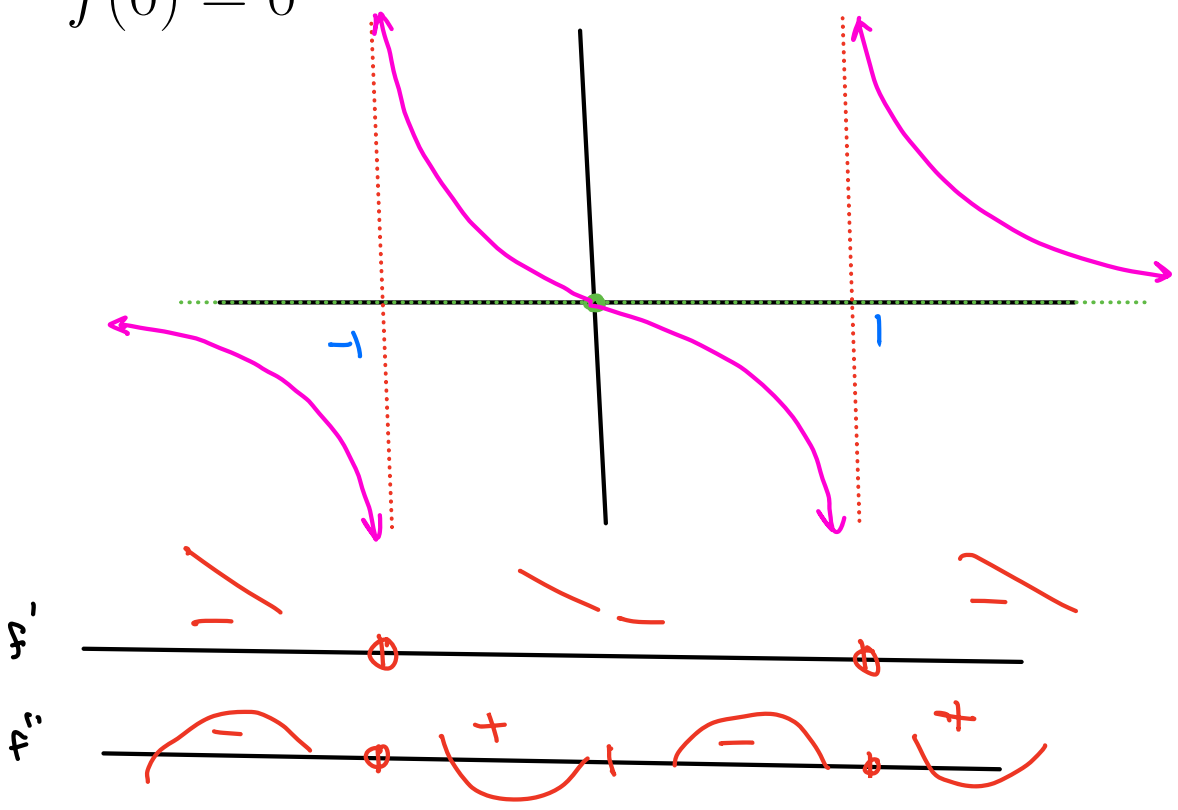
Horizontal asymptote of $y = 0$

$f'(x) < 0$ for $(-\infty, -1) \cup (-1, 1) \cup (1, \infty)$

$f''(x) > 0$ for $(-1, 0) \cup (1, \infty)$

$f''(x) < 0$ for $(-\infty, -1) \cup (0, 1)$

$f(0) = 0$

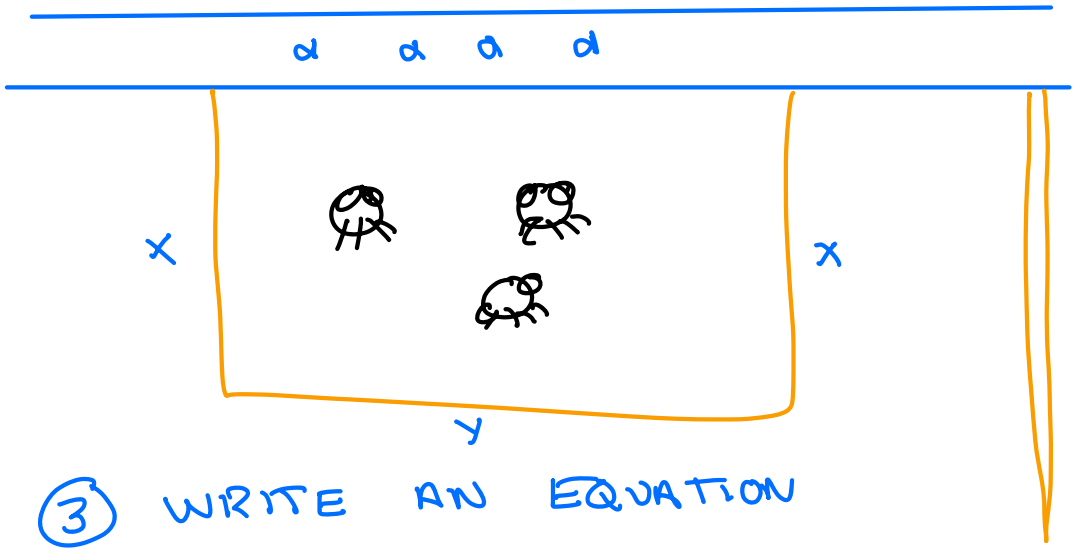


Applied Max - Min (Word Problems)

A farmer with 4000 meters of available fencing wishes to enclose a rectangular plot that borders on a straight river. If the farmer does not fence the side along the river, what is the largest area that can be enclosed?

Chris's 5 easy step method for max/min

1. Read the problem
2. Draw a picture



3. Write an equation

$A = xy$

4. Make equation have just 1 var.

$2x + y = 4000$

$y = 4000 - 2x$

$A = x(4000 - 2x) = 4000x - 2x^2$

5. Differ.

$$\frac{dA}{dx} = 4000 - 4x$$

(6) FIND C.P. AND END POINTS (IF POSS.)

$4000 - 4x = 0$

$x = 1000$ (C.P.)

$x = 0$

$x = 2000$

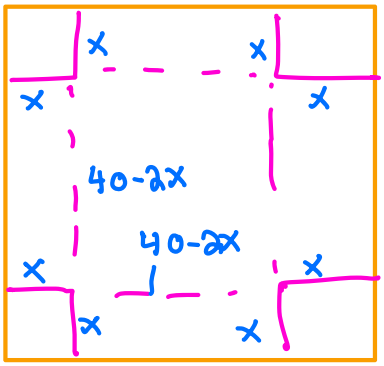
(7) FIND MAX / MIN

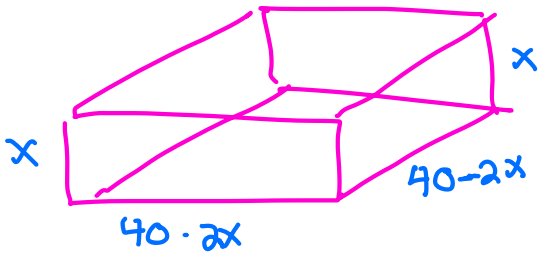
x	A	
1000	2,000,000	← MAX
0	0	
2000	0	

(8) ANSWER QUESTION.

LAR. AREA $2{,}000{,}000\ m^2$

A box, open at the top, is to be made from a square piece of cardboard by cutting a square out of each corner and turning up the sides. Given that the cardboard measures 40 cm on a side, find the dimensions of the box that will give the maximum volume. What is the maximum volume?





$$V = L \cdot W \cdot h$$

$$V = x(40-2x)(40-2x)$$

$$= x(40-2x)^2$$

$$\frac{dV}{dx} = x(2)(40-2x)(-2) + (40-2x)^2$$

$$40-2x\left[-4x+40-2x\right]$$

$$(40-2x)(-6x+40)=0$$

$$40-2x=0 \qquad -6x+40=0$$

$$x=20 \qquad x=\frac{40}{6}=\frac{20}{3}$$

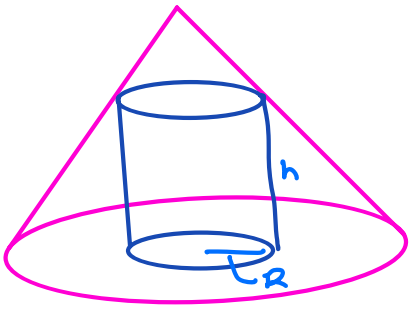
C.P $x=20$

E.P $x=0$ $x=20$

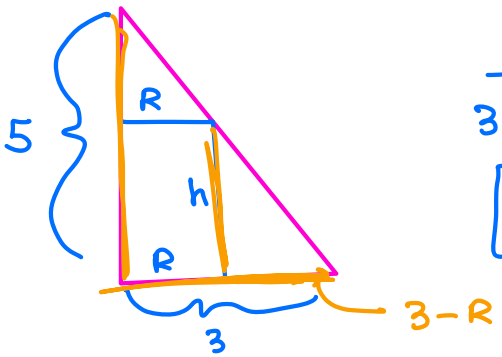
x	V
0	0
20	0
$\frac{20}{3}$	$\frac{20}{3}\left(40-\frac{40}{3}\right)^2$ max

$$\frac{20}{3} \times \left(40-\frac{40}{3}\right) \times \left(40-\frac{40}{3}\right)$$

Find the radius and the height of the right circular cylinder of greatest volume that can be inscribed in a right circular cone having a radius of 3 feet and a height of 5 feet.



$V = \pi R^2 h$



$$\frac{h}{3-R} = \frac{5}{3}$$

$$h = \frac{5}{3}(3-R)$$

$$V = \pi R^2 \left(\frac{5}{3}\right)(3-R)$$

$$V = \frac{5}{3}\pi(3R^2 - R^3)$$

$$\frac{dV}{dR} = \frac{5}{3}\pi(6R - 3R^2)$$

$$6R - 3R^2 = 0$$

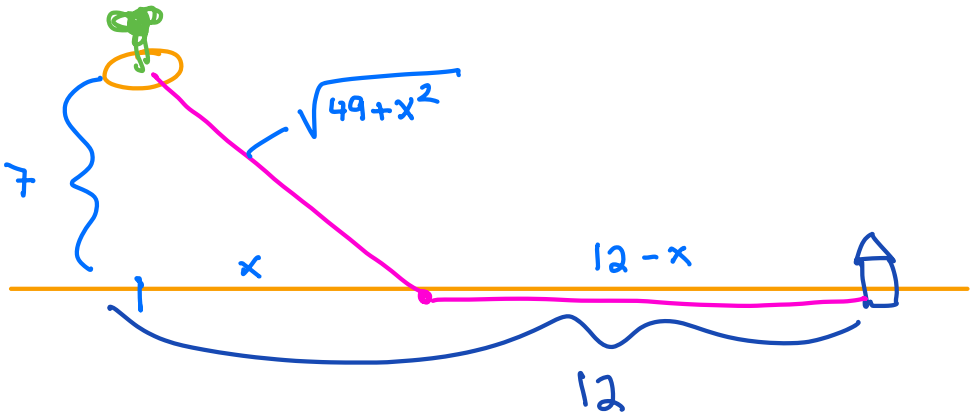
$$3R(2-R) = 0$$

C.P. $R = 0, 2$ $\qquad R = 0, 3$

R	V
0	0
2	$\frac{20\pi}{3}$ ← MAX
3	0

$R = 2, \; h = \frac{5}{3}$

A telephone wire is to be laid to an island seven miles off shore at cost of \$2,000 per mile along the shore and \$3,000 per mile under the sea. If the telephone station is 12 miles further up the shore, how should the project be planed to minimize costs?



$$C = C_W + C_L$$

$$C_W = 3000\, D_W$$

$$C_L = 2000\, D_L$$

$$C = 3000\, D_W + 2000 D_L$$

$$C = 3000\left(\sqrt{49+x^2}\right) + 2000(12-x)$$

$$\frac{dC}{dx} = (3000)\left[\frac{1}{2}(49+x^2)^{-\frac{1}{2}}(2x)\right] + (2000)(-1)$$

$$= \frac{3000x}{\sqrt{49+x^2}} - 2000 = 0$$

$$2000(49+x^2) = 3000x$$

$$4(49+x^2) = 9x^2$$

$$5x^2 = 196 \qquad x = \sqrt{\frac{196}{5}}$$

$x = 0$, $x = 12$

x	C
$\sqrt{\frac{196}{5}}$	39,652
0	45,000
12	41,677

$\leftarrow$ min