Homework #15

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Empire

4.5 #

Sketch $\dfrac{X}{X^3-1}$ using guidelines

A. domain $(-\infty, 1) \cup (1, \infty)$

b. $f(0) = \dfrac{0}{0-1} = 0$ y intercept $= 0$

$\dfrac{x}{x^3-1} = 0$, math solver x intercept $= 0$

c. $\dfrac{-x}{-x^3-1}$ = odd function

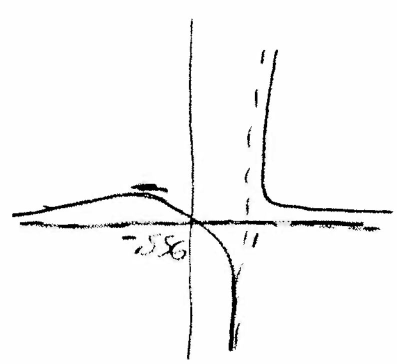
d. $f(x) \lim_{x \to \infty} \dfrac{x}{x^3-1} = 0$ tha va $= 1$;

e. $f'(x)\ \dfrac{x}{x^3-1} = \dfrac{(x^3-1)(1)-(x)(3x)}{(x^3-1)^2} = \dfrac{x^3-1-3x^2}{(x^3-1)^2}$

-2	0	1
-	ϕ	-

$\dfrac{-1-1-3}{(-1-1)^2} = \dfrac{-5}{(-2)^2} = \dfrac{-5}{4} = -1.25$

f. $f'(x) = 0$ $\dfrac{x^3-1-3x}{(x^3-1)^2} = 0$ Math solver $x = 1.879$, $x = -.556$

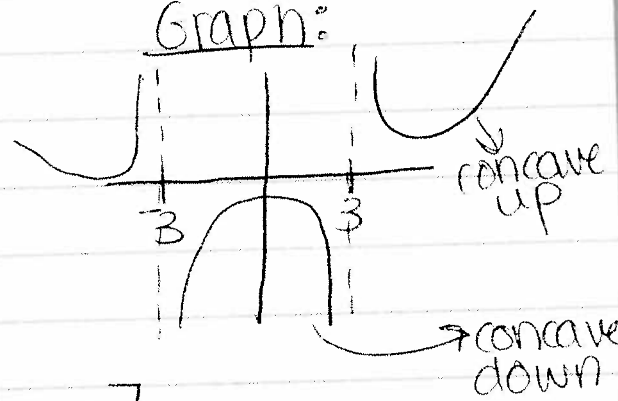


Team Kickass

4.6 #8

$$f(x) = \frac{e^x}{x^2-9}$$

Graph:



$$f'(x) = \left[\frac{(x^2-9)e^x - (2x)e^x}{(x^2-9)^2}\right] = 0$$

$$= x^2e^x - 9e^x - 2xe^x = 0$$
$$= e^x(x^2 - 2x - 9) = 0$$

use Qudratic Equation

$$= \frac{2 \pm \sqrt{4-4(-9)}}{2}$$

$$= 1 \pm \sqrt{10}$$

$f''(x) =$

TEAM: C. A. M.

~~4.5~~
4.7 Find a positive number such that the sum of the
#4 number and its reciprocal is as small as possible.

$$f(x) = x + \frac{1}{x}$$

$$f'(x) = 1 + \left(-\frac{1}{x^2}\right)$$

$$0 = 1 - \left(\frac{1}{x}\right)^2$$

$$-1 = -\left(\frac{1}{x}\right)^2$$

$$\sqrt{x^2} = \sqrt{1}$$

$$x = \pm\sqrt{1}$$

$$x = 1$$

$$f(1) = (1) + \frac{1}{(1)}$$

$$= 2$$

CASANDRA LUCERO
Augustin Ciocotisan
MAYA KHOSHBAYAR

4.7 #6

Area = Length * Width

Area = 1000

Perimeter = 2(L) + 2(W)

$$\frac{1000}{L} = \text{width}$$

$$P = 2(L) + 2\left(\frac{1000}{L}\right)$$

$$P = 2(L) + \frac{2000}{L}$$

The New Group

$$P' = 2 - 2000L^{-1}$$

$$2 = 2000/L^2$$

$$L^2 = 1000$$

$$L = \sqrt{1000}$$

Kristian, Melva, Jalisha Save the Polar Bears
4.7 #8

$$P = \frac{100I}{I^2+I+4}$$ Use Quotient Rule!

$$P' = \frac{I^2+I+4\frac{dy}{dI}(100I) - 100I\frac{dy}{dI}(I^2+I+4)}{(I^2+I+4)^2}$$

$$P' = \frac{I^2+I+4(100) - 100I(2I+1)}{(I^2+I+4)^2}$$

$$P' = \frac{100I^2+100I+400 - 200I^2 - 100I}{(I^2+I+4)^2}$$

$$P' = \frac{-100I^2 + 400}{(I^2+I+4)^2}$$

Set numerator equal to zero to find critical value where the function is at its max!

$$-100I^2 + 400 = 0$$

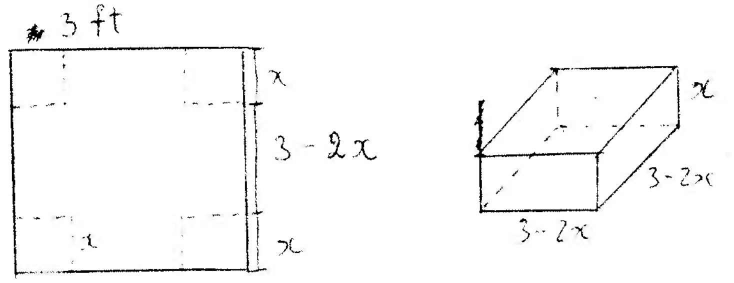
$$\frac{-100I^2}{-100} = \frac{-400}{-100}$$

$$I^2 = 4$$

$I = 2$ $\therefore$ P is a maximum at light intensity 2!

FR3CH

4.7 # 10



Find the largest volume of a box (open top) made from a square piece of cardboard 3ft wide, by cutting out a square from each of 4 corners and bending up sides.

Solution

Volume : $V = (3-2x)(3-2x)\,x$

$$= 4x^3 - 12x^2 + 9x$$

Derivitive of V:

$$V' = 12x^2 - 24x + 9$$

$$V' = 0 \iff 12x^2 - 24x + 9 = 0 \iff \left[\begin{array}{l} x = 1/2 \\ x = 3/2 \end{array}\right.$$

+ $x = \frac{1}{2}$: $V = (3 - 2\frac{1}{2})(3 - 2\frac{1}{2})\frac{1}{2} = 2\ ft^3$ (max)

+ $x = \frac{3}{2}$: $V = (3 - 2\frac{3}{2})(3 - 2\frac{3}{2})\frac{3}{2} = 0\ ft^3$ (min)

The largest volume of a box is $2\ ft^3$

CIVARC

J. KOHLHOFF

R. D'SOUZA

S. MONCE

SECTION 4.70

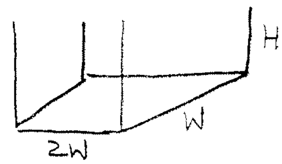
14. $V = 10m^3$

$V = L \times W \times H$

$V = (2W)(W)(H)$

$10m^3 = 2W^2(H)$

$\frac{10m^3}{2W^2} = H$



COST SIDE: $\$6/m^2 \quad = 2(6 \times WH) = 12WH$

$2[\$6(2W)(H)] = 24WH$

COST BASE: $\$10/m^2 = 2W(W)(\$10/m^2) = 20W^2$

$C = 36WH + 20W^2$

$C = 36W\left(\frac{10}{2W^2}\right) + 20W^2$

$C = \frac{180}{W} + 20W^2$

$C' = -180W^{2} + 40W = 0$

$\frac{180}{W} = 40W$

$\frac{18}{4} = W^2$

$4.50 = W^2$

$\sqrt{4.50} = 2.121\ldots\ldots$

$\boxed{W = 2.12}$

$H = \frac{10}{2(2.12)^2} = \boxed{1.112\ldots.}$

$C = 36(2.12)(1.11) + 20(2.12)^2$

$C = 84.72 + 89.89$

$\boxed{C = \$174.60}$

Br Is BS

Ryan ZHAO

Tiejun Wen

4.7.18

$6x + y = 9$ $\quad$ 1: $(-3, 1)$

$y = 9 - 6x$

$D^2 = (x+3)^2 + (y-1)^2 =$

$= (x+3)^2 + (9-6x-1)^2$

$= \underline{x^2} + 6x + 9 + 64 + \underline{36x^2} - \underline{96x}$

$= 37x^2 - 90x + 73$

$(D^2)' = 74x - 90 = 0$

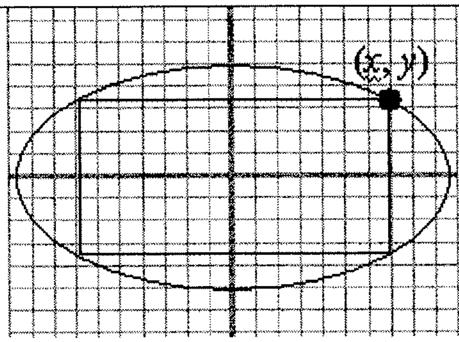
$x = \frac{90}{74} = \frac{45}{37}$

$y = 9 - 6\left(\frac{45}{37}\right) = \frac{63}{37}$

Point $\left(\frac{45}{37}, \frac{63}{37}\right)$

Grundle Pumpkins

Pages 329 4.7.22 Find the area of the largest rectangle that can be inscribed in the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$.



Solve i(Simple):

$\because a^2+b^2\geq 2ab(x,y,a,b>0)$

$\therefore 1=\frac{x^2}{a^2}+\frac{y^2}{b^2}\geq 2\sqrt{\frac{x^2}{a^2}\bullet\frac{y^2}{b^2}}=\frac{2xy}{ab}$

$\therefore xy\leq\frac{ab}{2}$

$\therefore A=4xy\leq 4\bullet\frac{ab}{2}=2ab$

Solve ii(Calculus):

the length of this rectangle will be 2x, and the width of this rectangle will be 2y

$\because x,y,a,b>0$

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1\Rightarrow y^2=b^2(1-\frac{x^2}{a^2})\Rightarrow y=b\sqrt{1-\frac{x^2}{a^2}}$$

$$A=2x\bullet 2y=2x\bullet 2b\sqrt{1-\frac{x^2}{a^2}}=\frac{4bx}{a}\sqrt{a^2-x^2}$$

$$A'=\frac{4b}{a}(x\bullet\frac{1}{2}(a^2-x^2)^{(-\frac{1}{2})}(-2x)+\sqrt{a^2-x^2})$$

$\because A'=0$(set the derivative equal to zero)

$$\therefore 0=\frac{4b}{a}(\frac{x}{2}(-2x)+(a^2-x^2))=4ab-\frac{8b}{a}x^2\Rightarrow x=\frac{a}{\sqrt{2}}$$

$$\therefore A=\frac{4b\frac{a}{\sqrt{2}}}{a}\sqrt{a^2-(\frac{a}{\sqrt{2}})^2}=\frac{4b}{\sqrt{2}}\sqrt{a^2-(\frac{a}{\sqrt{2}})^2}=\frac{4b}{\sqrt{2}}\sqrt{\frac{a^2}{2}}=2ab$$

Sam Tobia

Pablo Espichan

Tiejun Wen

4.7 We Love Math

40. $F = \frac{\mu W}{\mu \sin\theta + \cos\theta}$

$\frac{d}{dx}\ (\mu W)(\mu \sin\theta + \cos\theta)^{-1}$

$\mu W(-1)(\mu \sin\theta + \cos\theta)^{-2}(\mu\cos\theta - \sin\theta) = 0$

has to be 0

$\frac{u \cancel{\cos\theta}}{\cancel{\cos\theta}} = \frac{\sin\theta}{\cos\theta}$

$u = \tan\theta$

$\theta = \tan^{-1} u$

LWV

4.7 #53

WILGENS
VIVIENE

$$\bar{C}(x) = \frac{C(x)}{x}$$

$$C(x) = 16000 + 200x + 4x^{3/2}$$

$x = 1000$ units

$\cancel{C(x)}$ $C(1000) = 16000 + 200(1000) + 4(1000)^{3/2}$

$C(1000) = \$\,342,491$

$$\bar{C}(x) = \frac{C(x)}{x} \Rightarrow \bar{C}'(x) = \frac{x\,C'(x) - C(x)}{x^2} = 0$$

$$x\,C'(x) - C(x) = 0 \Rightarrow x\,C'(x) = C(x)$$

$$C'(x) = \frac{C(x)}{x}$$

$$C'(x) = \frac{342491}{1000} \Rightarrow A.C = 342.49/\text{units}$$

$$C'(x) = 200 + 6x^{1/2} = 200 + 6(1000)^{1/2}$$

$M.C = 389.74/\text{units}$

(ii) Production level that will minimize the A.C $\quad C'(x) = 0$

$$200 + 6x^{1/2} = 0$$

$$6x^{1/2} = -200 \Rightarrow (x^{1/2})^2 = \left(-\frac{200}{6}\right)^2$$

$$x = (33.33)^2 = 1111.$$

~~4.7~~ HWV

4.7
#53

$$C(x) = \frac{16000 + 200(1111) + 4(1111)^{3/2}}{1111}$$

$$= \frac{27525348}{1111}$$

$= \$247.75$ is minimum Average cost.

MAT151... Team α 4/13/10

4.7) #54

54.) a.) show that if the profit $P(x)$ is a max., then the marginal revenue equals the marginal cost.

□ total profit: $P(x) = R(x) - C(x)$

marginal rev: $R'(x)$; $\left[R(x) = xp(x) \Rightarrow R'(x) = \overset{\text{product rule:}}{xp'(x) + p(x)} \right]$

marginal cost: $C'(x)$

ans: To $P(x)$ is a max: $P'(x) = R'(x) - C'(x) = 0 \Rightarrow \boxed{R'(x) = C'(x)}$

$xp'(x) + p(x) = C'(x)$

b.) if $[C(x) = 16000 + 500x - 1.6x^2 + 0.004x^3]$ is the cost function & $[p(x) = 1700 - 7x]$ is the demand function, find the production lvl. that will maximize profit.

□ $R(x) = xp(x)$, $p(x) = 1700 - 7x$: $R(x) = x[1700 - 7x]$

$R(x) = 1700x - 7x^2 \Rightarrow [R'(x) = 1700 - 14x = 0] \Rightarrow x = 121.4$

$C(121.4) = 16000 + 500(121.4) - 1.6(121.4)^2 + 0.004(121.4)^3$

$= 16{,}000 + 60{,}700 - 23{,}580.74 + 7156.75$

$= 76700 - 23{,}580.74 + 7156.75$

$= 53{,}119.26 + 7156.75$

$\boxed{= 60{,}276.01}$

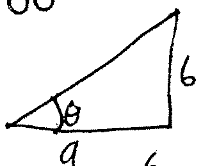
★ 60,276.01 is the production that will max. profit.

Mike Ganhuyag

Jonathan Chen

Science Buddies

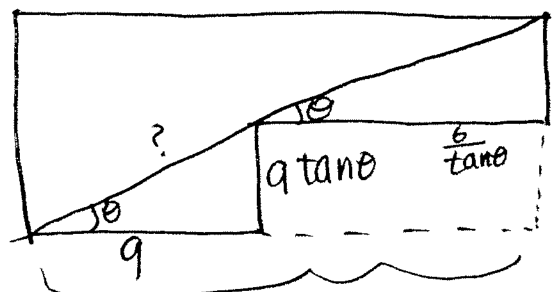
#66 (4.7)



$\frac{6}{a} = \tan\theta$

$\frac{6}{\tan\theta} = a$

$\Longrightarrow$



$a = (6 + 9\tan\theta)$

$b = \left(9 + \frac{6}{\tan\theta}\right)$

Pythgorious theorom

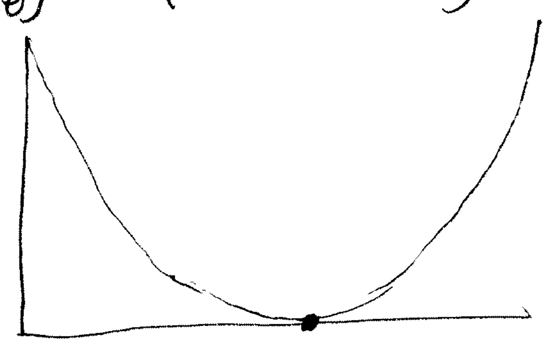
$$a^2 + b^2 = c^2$$

$$\left(9 + \frac{6}{\tan\theta}\right)^2 + (6 + 9\tan\theta)^2 = c^2$$

Using Calculator $\Rightarrow$

$$y = \left(9 + \frac{6}{\tan\theta}\right)^2 + (6 + 9\tan\theta)^2$$

change window
X min = 0
X max = 1.5
then Hit "zoom fit"



then $\boxed{\text{2nd}}$ → Calc → $\boxed{\text{minimum}}$ (#3) ente

left Bond = .1 enter

Right Bound = 1.4 enter = 1.388

S.B

#66

minimum = .38891

Then plug minimum in $\tan\theta$

$$\sqrt{c^2} = \sqrt{\left(9+\frac{6}{\tan(.38891)}\right)^2 + \left(6+9\cdot\tan(.38891)\right)^2}$$

$\boxed{c = 17.8113}$ is the length of the pipe that can carried horizontally around the corner.