MAX / MIN PROBLEMS w/ CONSTRAINTS

1. Find Main Idea

$$D(x,y) = \sqrt{(x-5)^2+(y-16)^2}$$

↑ Function of 2 variables

2. Identify Constraints. (-1 constraint for variables)

$$y = 16 - x^2$$

3. Made Main Idea Function of 1 variable

$$D(x) = \sqrt{(x-5)^2 + (16-x^2-16)^2}$$

or

$$D(x) = (x-5)^2 + x^4$$

4. Use calculator or by Hand.

A. $D_x = 0$ Critical points

B. Use 1ST or 2ND derivate tests.

$$4x^3 + 2x - 10 = 0$$

$x \approx 1.2348\ldots$ ← critical Pt

$y = 16 - x^2 = 14.47\ldots$

CAN CAN

Main Idea $V = \pi r^2 h$

Constraint Area $= 800 \text{ in}^2$

Top Circle. Bottom Side

$\pi r^2 + \pi r^2 + h \cdot 2\pi r = 800$

$2\pi r^2 + 2\pi r h = 800$

$h = \dfrac{800 - 2\pi r^2}{2\pi r}$

Main Idea $V(r,h)$

1 variable

$V(r) = \pi r^2 \left(\dfrac{400 - 2\pi r^2}{2\pi r}\right)$

$= 400r - 2\pi r^3 = 0$

$= (400 - \pi r^2) r = 0$

$V'(r) = 400 - 3\pi r^2$

$r^2 = \dfrac{400}{3\pi}$

$r = \dfrac{20}{\sqrt{3\pi}}$

$= 6.51$

$r = \dfrac{20}{\sqrt{\pi}} = 11.28$

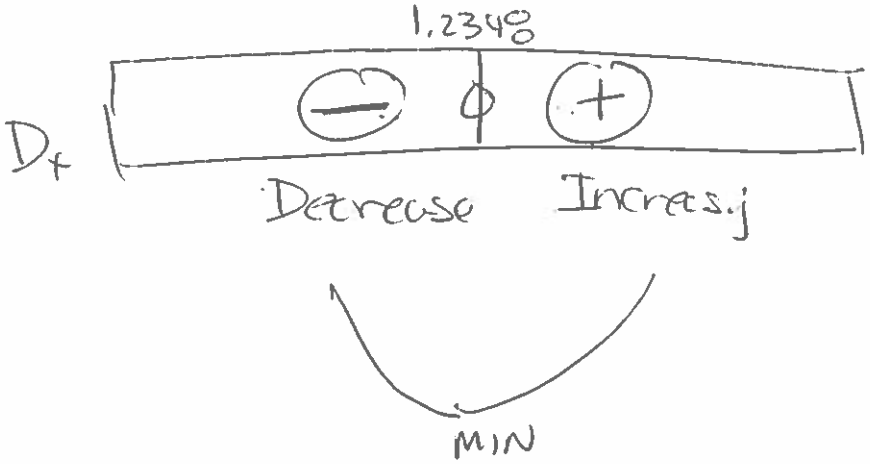
$C = 22.56$

$h = \dfrac{800 - 2\pi r^2}{2\pi r}$

$h = 22.56$

D: 13. $h = 13$

1st Derivate Test



$D_x(1) =$

$4(1)^3 + 2(1) - 10 =$

$4 + 2 - 10 = \ominus$

$D_x(2) =$

$4(2)^3 + 2(2) - 10 = \oplus$

2nd Derivate Test

$$D_{xx} = 12x^2 + 2$$

$$D_{xx}(1.2348\ldots) = 12(1.23)^2 + 2 = \oplus$$

Concave Up $\Rightarrow$ MIN

$D_{xx} = \oplus$ MIN $\quad D_{xx} = \ominus$ MAX $\quad D_{xx} = 0$ Inconclusive

Ex $\quad y = x^4$

$y' = 4x^3 = 0$ Critical $x = 0$

$y'' = 12x^2 \quad y''(0) = 0$

$y'(-.1) = -4 = \ominus$ $\quad y'(+1) = 4 \oplus$

MIN.

1. Identify a critical Point to your Quartic Regression

MAX 13.094... = X

2. Confirm with 1st Derivative Test

3. Confirm with 2nd Deriv Test.

GROUP NAME:	Student Names (First and Last)
Logo:	Speaker/Presenter: Aidan Callahan
Date:	Writer/Prep: Cam Ackerley
Topics:	QC/Leader: Kyle

Instructions:

min & max

$y_1 = reg$

$y_2 = nderive(y_1, x, x)$

$y_3 = nderive(y_2, x, x)$

x	y_1	y_2	y_3

GROUP NAME: WOLFPACK	**Student Names (First and Last)**
Logo:	**Speaker/Presenter:** Jared
Date: 11/4/13	**Writer/Prep:** DC
Topics:	**QC/Leader:** Quay

Instructions:

$Y_1 = 15.1995x^4 + 619.7057x^3 - 92339.7490x^2 + 6188543.8029x - 155439040.4$

$Y_1' = 60.798x^3 + 1859.1171x^2 - 184678.49x + 6188543.8029$

$Y_1'' = 182.394x^2 + 3578.2342x - 184678.49$

X	Y_1
96.842	683.9
99.654	-943.2
105.47	10470

Y_1'	Y_1''	
- 4	-1500	MAX
0	1025 ÷	MIN
+ 4	-3425	MAX

Decrease, 0, Increase ⇒ MIN

GROUP NAME:	Student Names (First and Last)
Logo:	Speaker/Presenter:
Date:	Writer/Prep:
Topics:	QC/Leader:

Instructions:

13.7 | 9 | .176 | -51.61

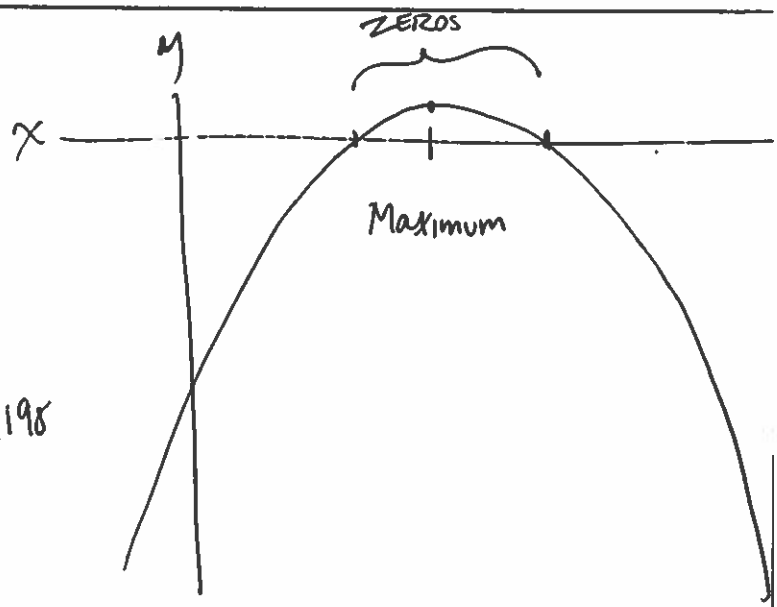
13 | 23. | -17.53

14 | -61.77

GROUP NAME: IRISH MATH BOMBS	**Student Names (First and Last)**
Logo:	**Speaker/Presenter:** Robby Cranor
Date:	**Writer/Prep:** Connor Krupsman
Topics:	**QC/Leader:** Buffalo Bill Smith

Instructions: PBR Sales (2003 - 2013)

x	y
3	13
5	15
7	16
9	19
11	20
13	21



$y = -.0013x^4 + .0835x^3 - .292x^2 + 1.89x + 4.198$

$y_1 = nDeriv(y_1, x, x)$

$y_2 = nDeriv(y_2, x, x)$

What does the prof say?

6

Wrong wrong Wray Wray Wrong

PROF. PORTER

MATH CLASSWORK

GROUP NAME: Time Is Money

Logo: 

Student Names (First and Last)

Speaker/Presenter: Angelika Mazurek

Writer/Prep: Shyiam Singh (Shiv)

QC/Leader: Eugenio Pelaez

Date: 11/4/13

Topics: Max & Min

Instructions:

Sale of IPhone 4S

Identify a critical point in your Quad [2nd] Calc 4: Maximum

Max x = .0140592, Y = 755.04228

Y_1 = 3.7

Y_2 = nderiv(Y_1, x, x)

Y_2 nderiv(Y_2, x, x)

x	Y_1	Y_2	Y_3	Max
.0140592	755.04	-2[E]4	-429.2	(concave down)
0	755	-6	-423.8	
-1	474	649.17	-910.8	

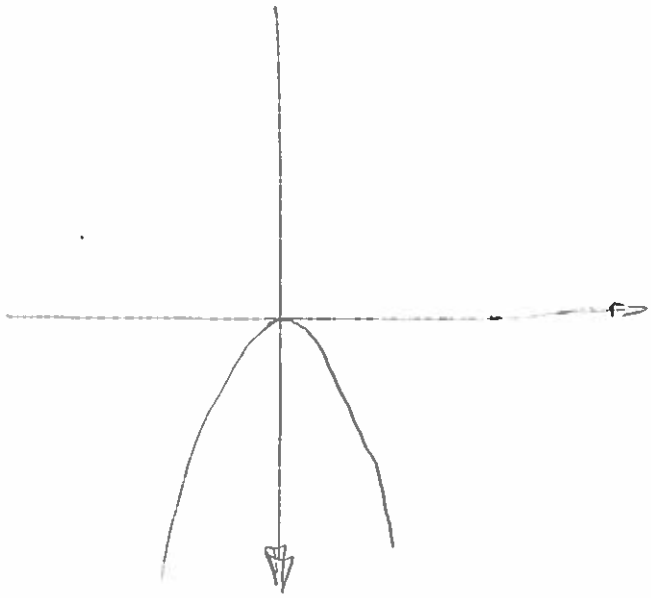
GROUP NAME: C C	**Student Names (First and Last)**
Logo:	**Speaker/Presenter:**
Date: 11/4/13	**Writer/Prep:**
Topics:	**QC/Leader:** Stephen Smith

Instructions:

MAXIMUM

GROUP NAME: Tre factors	**Student Names (First and Last)**
Logo:	**Speaker/Presenter:** Ryan Cheney
Date: 1/4/18	**Writer/Prep:** Ryan Bigley
Topics:	**QC/Leader:** Ethan Stewart

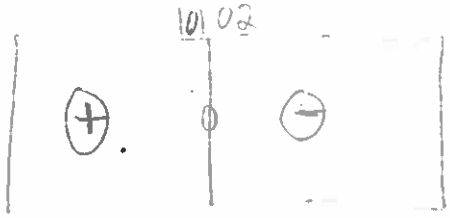
Instructions:



Maximum

$x = 101.0238$ $y = 9.2760527$

1st derive + 1st



- maximum

2nd derive + 1st

— concave down

$-0.0696 = y^3$

GROUP NAME: Hippos - Hippos	**Student Names (First and Last)**
Logo:	**Speaker/Presenter:** [illegible]
Date: [illegible]	**Writer/Prep:** [illegible]
Topics:	**QC/Leader:** [illegible]

Instructions: Find min and max.

y_1 = reg.
y_2 = nDeriv(y_1, x, x)
y_3 = nDeriv(y_2, x, x)

X	y_1	y_2	y_3
1.96	9.005	-0.001	~~11.28~~
1	6	1.33	-11
2	9	-0.166	-4

• MAX

D_{xx} = (−) = MAX