Related Rates

'51 TR
d12

$\frac{dy}{dx}$ = $ per year
ppm per hr
oz rust per year
shoes per $

per = $\frac{\text{o}}{\text{o}}$

bbl per hour Volume per min

$\frac{dx}{dt}$ $\frac{dV}{dt}$

$x = 3$ value.

$$\frac{d}{dx} x^3 = 3x^2$$

$$\frac{d}{dt} x^3 = 3x^2 \cdot \frac{dx}{dt}$$

$$x\frac{dx}{dt} + y\frac{dy}{dt} = z\frac{dz}{dt}$$

Balloon is rising $10'/sec = dy/dt$

After 2 sec $y = 10 \cdot 2 = 20'$

If I stand $25'$ away from balloon staring part

Then $x = 25$ And standing

Stand still $\frac{dx}{dt} = \underline{0}$ $x = 25$

Walking away from balloon at $2'/sec = dx/dt$

Walking towards balloon at $-2'/sec = dx/dt$

$$y\frac{dy}{dt} = z\left(\frac{dz}{dt}\right)$$

How fast is z changing. dz/dt

$$\frac{dz}{dt} = \frac{y}{z}\frac{dy}{dt}$$

$$= \frac{10y}{z}$$

$$x^2 + y^2 = z^2$$

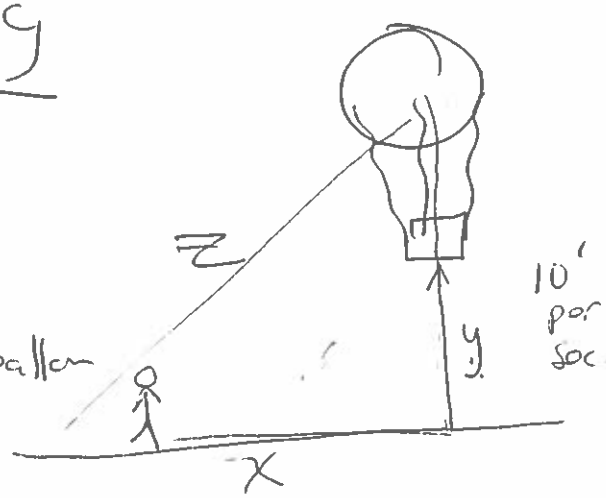
$$\frac{d}{dt}\left(x^2 + y^2\right) = \frac{d}{dt}\left(z^2\right)$$

$$2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 2z\frac{dz}{dt}$$

Rates	Values
dx/dt	x
dy/dt	y
dz/dt	z

Balloon Rising

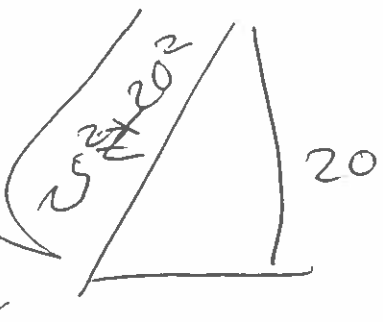
$$\frac{dy}{dt} = 10'$$



After 2 sec. How High is ballon

$y = 2 * 10 = 20'$

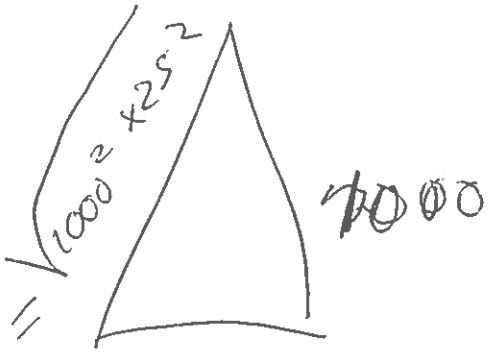
At $t = 2$ seconds $\quad y = 20$



$$\frac{dz}{dt} = \frac{10 \cdot (20)}{31} \approx 6.45 \text{ ft/sec}$$

$$z = 31.2$$

At $t = 100$ seconds



$$\frac{dz}{dt} = \frac{1000 \cdot 10}{1000.31} = 9.996 \text{ ft/sec}$$

$$\approx 10 \text{ ft/sec}$$

$$\frac{dz}{dt} = \frac{0 \cdot 10}{25} = 0$$

Air

1000 cc per sec

$\frac{dV}{dt} = 1000$

$V =$

Filling Balloon

$V = \frac{4}{3}\pi r^3$

chain rule

$\frac{dV}{dt} = 4\pi r^2 \cdot \frac{dr}{dt}$

Rates

$dV/dt = 1000$

$dr/dt = ?$

Values

$r =$

$\frac{dr}{dt} = \frac{1000}{4 \cdot \pi (r)^2}$

First blow...

$r = 1$

$dr/dt = \frac{1000}{4\pi} = 785 \frac{cm}{Se}$

$r = 10$

$dr/dt = \frac{1000}{400\pi} = .79 \frac{cm}{Se}$

Selling Balloons

$$\text{Revenue} = P \times S.$$

$$= x(\text{reg Eq}(x))$$

$$\frac{dR}{dt} = x\,\text{reg}'(x)\frac{dx}{dt} + \text{reg}\,\frac{dx}{dt}$$

$$\frac{dR}{dt} = (x\,\text{reg}'(x) + \text{reg})\frac{dx}{dt}$$

Rates	Values
$dR/dt =$	$x = \$1$
$dx/dt =$	

At \$1 start raising price by \$.50/week

How much is my revenue changing?

$$R'(1) = 1.73 \times 10^6$$

Times $\frac{dx}{dt} = .50$

Revenue is increasing by \$1119.43/week

GROUP NAME: I ♡ Science

Date: 3/6

Student Names (First and Last)

Speaker/Presenter: Lindsay Cushing

Writer/Prep: Corrina Hansen

Independant Variable (x-axis): Time (hrs)

Dependant Variable (y-axis): Drug Concentration (ppm)

Leader/Collaborator:

Conclusion (in words):

At 2 hours, the rate is increasing by 0.18792 ppm/min.

Supporting Work:

X	y
0	100
1	85
2	60
3	55
4	20
5	15

$y = 121.8\ldots(0.6720\ldots)^x$

$Y_1 = [121.8\ldots(0.6720\ldots)^x] \cdot x$

$Y_2 = nDeriv(Y_1, X, X)/60$

X	Y_1	Y_2
1	81.873	0.82211
2	110.03	0.18792
5	83.472	-0.2748

GROUP NAME: iShoes

Date: 3/6/14

Student Names (First and Last)

Speaker/Presenter: D...e C.

Writer/Prep: Jay Sinclair

Leader/Collaborator:

Independant Variable (x-axis): years ~~shoes in thousand~~

Dependant Variable (y-axis): ~~in thousand~~ shoes dog owners

Conclusion (in words):

~~after 12.12~~

12.12 dog owners per year, so there is one new dog owner per month.

Supporting Work:

$y_1 = 13.21... * 1.13...^x$

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

X	y_1	y_2
15	93.15	12.12

X	Y
3	17
6	28
7	39
9	41

GROUP NAME: E1 Business

Date: 3/6

Student Names (First and Last)

Speaker/Presenter: Ryan

Writer/Prep: Brittany

Leader/Collaborator:

Independant Variable (x-axis): Cups

Dependant Variable (y-axis): goals

Conclusion (in words): In the 4th world cup the rate of goals scored is increasing by .5608 goals/year

Supporting Work:

$\frac{dr}{dt} = (x\,reg(x) + reg)\frac{dx}{dt}$

STAT Edit L_1 & L_2

STAT ▶ Calc 0: exp

Vars 5: ▶ ▶ Enter

y_1 = regression

y_2 MATH 8:

Vars ▶ 1: 1:

nDeriv(y_1, x, x) =

y_2 = nDeriv(y_1, x, x) ÷ 4 =

2nd Graph

X	Y_1	Y_2
1	34.233	.47482
2	36.186	.5019
3	38.25	.53055
4	40.432	.5608
5	42.739	.5928

GROUP NAME: Rusty Jail Birds

Date: 06MAR14

Student Names (First and Last)

Speaker/Presenter: Grey McAoy

Writer/Prep: Keith Mosera11

Leader/Collaborator:

Independant Variable (x-axis): years

Dependant Variable (y-axis): # of Russians ar in the ukraine/1000

Conclusion (in words): in year 4 the rate of Russain soldiers invading the ukraine is 0.02189 per day.

Supporting Work:

$y = a + b \ln x$

$a = -31.1882288$

$b = 31.95578995$

X	Y
1	210
2	340
5	19
6	512

X	y1	y2
4	13,172	0.02189
5	20.243	0.01751

GROUP NAME: Squiggles R Us

Date: 3/6/14

Student Names (First and Last)

Speaker/Presenter: Kevin V

Writer/Prep: Anik Patel

Leader/Collaborator: Kevin I

Independant Variable (x-axis): Drinks drank per hour

Dependant Variable (y-axis): Hours of party

Conclusion (in words):

at hour 6 the number of drinks is dropping by .026 per hour

Supporting Work:

X	Y
1	75
2	215
3	278
4	153
5	34

expreg

$y = a \times b^x$

a = 146.8575715

b = .9887049429

X	Y_1	Y_2
60	74.307	-.8437
.01667	146.83	-1.667
	137.19	-.026