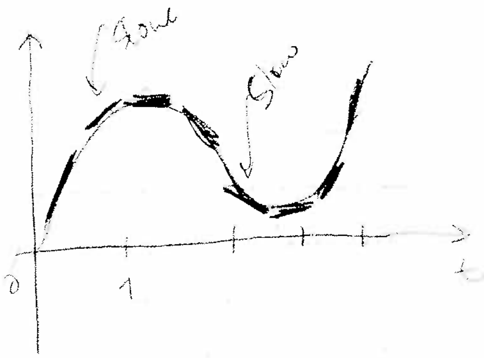
Homework #8

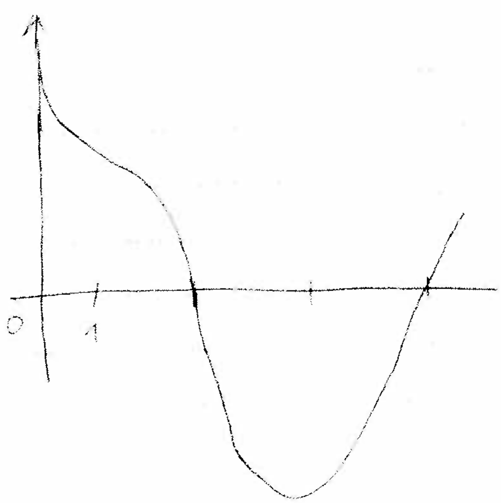
3.7 #6 New Group

6. a.



speeding up when
$0<t<1$
slowing down when
$1<t<2$
speeding up when
$3<t<4$

b.



speeding up when
$0<t<1$
Slowing down when
$1<t<3$
speeding up when
$3<t<4$

3.7 #10

FR3CH

3.7 - 10/231: $s(t) = 80t - 16t^2$; $v = s'(0) = 80$ ft/s

a/ What is the max height ? ($s_{Max} = ?$)

$s(t) = 80t - 16t^2$

$\Rightarrow s'(t) = 80 - 32t$

s_{Max} when $s'(t) = 0$

$\Leftrightarrow 80 - 32t = 0$

$\Leftrightarrow t = 2.5$

$\Rightarrow s_{Max} = s(2.5) = 80(2.5) - 16(2.5)^2$

$= 100$ ft

b/ When $s = 96$ ft : find v

$s(t) = 96$

$\Leftrightarrow 80t - 16t^2 = 96$

$\Leftrightarrow \left[\begin{array}{l} t = 2 \\ t = 3 \end{array}\right.$

+ On its way up : $t = 2$

$\Rightarrow v = s'(2) = 80 - 32.2 = 16$ ft/s

+ On its way down : $t = 3$

$\Rightarrow v = s'(3) = 80 - 32.3 = -16 = 16$ ft/s

3.7 #16

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

~~Pts~~ 5 ~~Gm~~

GRUNDLE Pumpkins

$\lim_{x \to 5} = \frac{d}{dx}\left(\frac{4}{3}\pi(x)^3\right)$

$= 2\left(\frac{4}{3}\pi x^2\right)$

$= \cancel{3}\frac{4}{\cancel{3}}\pi(25) = \cancel{209.4395}$

$4(\pi)(25) = 314.1592$

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5 to 8 $v = \frac{4}{3}\pi(5)^3$ $Y_x = \frac{4}{3}\pi(8)^3$

$\frac{\frac{4}{3}(125-512)}{5-8} = \frac{\frac{4}{3}\pi(387)}{3} = 54.035$

---

5 to 6 $\cancel{\frac{4}{3}\pi(5)^3}$

$\frac{\frac{4}{3}\pi(125-216)}{5-6} = \frac{\frac{4}{3}\pi(91)}{1} = 381.1799$

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5 to 5.1

$Y = \frac{4}{3}\pi(5)^3$ $Y_{5.1} = \frac{4}{3}\pi(5.1)^3$

$= \frac{\frac{4}{3}\pi(125-132.651)}{5-5.1} = \frac{\frac{4}{3}\pi(76.51)}{.1}$

$= 3204.8483$

3.7
#18

Science Buddie$

#18 $V = 5000\left(1 - \frac{t}{40}\right)^2 \quad 0 \le t \le 40$

find the rate at which water is draining from the tank after.

a) 5min b) 10 min c) 20 min d) 40min

$t=0 \rightarrow$ Plug in $V = 5000\left(1 - \frac{0}{40}\right)^2 = 5000$

$t = 5min$

$V = 5000\left(\frac{40-5}{40}\right)^2 = 5000(.765625) = 3828.125$

$t = 10min$

$V = 5000\left(\frac{40-10}{40}\right)^2 = 5000(.5625) = 2812.5$

$t = 20min$

$V = 5000\left(\frac{40-20}{40}\right)^2 = 5000(.25) = 1250$

$t = 40min$

$V = 5000\left(\frac{40-40}{40}\right)^2 = 5000(0) = 0$

Average rate of change:-

$t = 0min$ to $t = 5min$

$a = \frac{5000 - 3828.125}{0 - 5} = \boxed{-234.375}$ gallons/min

$t = 0min$ to $t = 10min$

$a = \frac{5000 - 2812.5}{0 - 10} = \boxed{-218.75}$ gallons/min

$t = 0min$ to $t = 20min$

$a = \frac{5000 - 1250}{0 - 20} = \boxed{-187.5}$ gallon/min

$t = 0min$ to $t = 40min$

$a = \frac{5000 - 0}{0 - 40} = \boxed{-125}$ gallons/min

water flowing faster is 5 minutes!

slowest is 40 minutes!

3.7
#24

TEAM: C.A.M.

Section 3.7

#24

$n = f(t) = \dfrac{9}{1+be^{-0.7t}}$

$t = 0$
$p = 20$ cells
$R = 12$ cells/hr.
$a = ?$
$b = ?$

$f'(t) = \dfrac{0.7\,abe^{-0.7t}}{(1+be^{-0.7t})^2}$

$f(0) = \dfrac{9}{1+b} \to 20$

$f'(0) = \dfrac{.7ab}{b^2+2b+1} = 12$

$a = 20 + 20b$

$0.7(20+20b)b =$
$12b^2 + 24b + 12 =$
$14b + 14b^2 =$
$12b^2 + 24b + 12$
$2b^2 - 10b - 1^2 = 0$
$b^2 - 5b - 6 = 0$
$25 + 4 \cdot 6 = 49 = 7^2$
$\dfrac{5-7}{2} = 1 \quad b_2 = 6$

$a_1 = 0 \qquad b_1 = -1$
$a_2 \ 140 \qquad b_2 = 6$

3.7 #26

Team Kickass

3.7 #26

$\boxed{\text{STAT}}$ → $\boxed{\text{EDIT}}$ → 1: EDIT → ENTER

L1	L2
1950	23.6
1955	23.8
1960	24.4
1965	24.5
1970	24.2
1975	24.7
1980	25.2
1985	25.5
1990	25.9
1995	26.3
2000	27.0

a) $\boxed{\text{STAT}}$ → CALC → 7: ↓ QuartReg

$A(t) = at^4 + bt^3 + ct^2 + dt + e$

$a = -3.076923\ E{-6}$

$b = .0243620824$

$c = -72.33147086$

$d = 95442.50365$

$e = -47224986.6$

$R^2 = .9824976169$

c) Average Rate of Change

$\frac{\Delta y}{\Delta x} = \frac{.4}{5} = .08 \frac{\text{million}}{5\text{years}}$

b) $A'(t) = 4at^3 + 3bt^2 + 2ct + d$

3.7
#27

Pythagorus

27 $r = 0.01$ cm
length = 3cm

$$V = \frac{P}{4\eta l}(R^2 - r^2) \text{ with } R = 0.1,\ l = 3\ \ P = 3000\ \eta = 0.027$$

a) $V_{(r)} = \frac{3000}{4(0.027)(3)}((0.01)^2 - r^2)$

$V_{(0)} = 0.925$ cm/s

$V(0.005) = 0.694$ cm/s
$V(0.01) = 0$

(b) $V(r) = \frac{P}{4\eta l}(R^2 - r^2)$

$V'(r) = \frac{P}{4\eta l}(-2r) = \frac{-Pr}{2\eta l}$ $\quad l = 3,\ P = 3000,\ \eta = 0.027$

$V'(r) = \frac{3000r}{2(0.027)3}$

$V'(0) = 0$
$V'(0.005) = -92.592$ cm/s
$V'(0.01) = -185.185$ cm/s

(c) The velocity is greatest where $r = 0$

Velocity change the most where $r = R = 0.01$ cm

3.7 #29
The Group

Yves Mosoule

29) $C(x) = 1200 + 12x - 0.1x^2 + 0.0005x^3$

a) $12 - 0.2x + 0.0015x^2$

b) $C'(200) = 12 - 0.2(200) + 0.0015(200)^2$
$= 12 - 40 + 60$
$C'(200) = 32$

c) $C(201) - C(200) = 1200 + 12(201) - .1(201)^2 + .0005(201)^3$
$-(1200 + 12(200) - .1(200)^2 + .0005(200)^3)$
$=$
$1200 + 2412 - 4040.1 + 4060.3005$
$-(1200 + 2400 - 4000 + 4000)$
$C(201) - C(200) = 32.20$

3.7
#30

Will Arbito

B.A is B.S

,0 $C(x) = 339 + 25x - 0.09x^2 + 0.0004x^3$

A) $C' = 25 - .18x + .0008x^2$

$C(100) = 25 - .18(100) + .0008(100)^2$

$= 15$

B) $C'(101) = 25 - .18(101) + .0008(101)^2$

$= 14.98$

$C'(100) - C'(101) = .02$

3.7 #31

MAT151...
3.7) #31 Team: α

3/2/10

Jonathan Chen
Mike Ganbolhuyag
Sam Guan Σ

31.) $p(x)$ = total value production [based on (x) workers] function

avg. productivity : $a(x) = \frac{p(x)}{x}$

quotient rule:

a.) $a(x) = \frac{P(x)}{x} \Rightarrow \frac{dy}{dx} = \frac{d}{dx}\left(\frac{P(x)}{x}\right) \Rightarrow \frac{x\left[\frac{d}{dx}P(x)\right] - \frac{d}{dx}(x)P(x)}{(x)^2}$

if $[a'(x) > 0]$ $\quad a'(x) = \frac{x P'(x) - P(x)}{x^2}$

[when $a'(x) > 0$]:
└ the average productivity increases as new workers are added.

c.) show that $[a'(x) > 0]$ if $[p'(x) > a(x)]$

$a(x) = \frac{P(x)}{x}$: $a'(x) = \frac{xp' - p}{x^2} \Rightarrow \frac{xp'}{x^2} - \frac{p}{x^2} = \frac{p'}{x} - \frac{p}{x^2}$

$\Rightarrow A' = \frac{1}{x}(p' - p/x)$ $\quad$ [$p/x = a(x)$]

$= \frac{1}{x}(p' - a)$

└ if $[p'(x) > a(x)]$ & $[a'(x) > 0]^{*}$ then $[p'(x) - a(x)]$
must be > 0.

LiW.V
Letrice
Wilgrens
Viviene

3/3/10.

3.8
#3.

$t = 0$ in 100 cells

$P(t) = 100e^{kt}$

$P(0) = 100e^{k(0)}$

$t = 1$ in 420 cells

$P(t) = 100e^{kt}$

$P(1) = 100e^{k(1)} = 420.$

$\frac{100e^{k}}{100} = \frac{420}{100}$

$e^{k} = \frac{420}{100}$

$k = \ln \frac{420}{100}$

$k = 1.435$

a) $P(t) = 100e^{1.435t}.$

b).

$P(t) = 100e^{1.435t}$

$t = 3$ hrs

$P(3) = 100e^{1.435(3)}$

$P(3) = 100e^{4.305}$

$= 7407$ bacterias

c.) $P(t) = 100e^{kt}$

$P'(t) = 100ke^{kt}$

$t = 3$ hrs, $k = 1.435$

$P'(3) = 100 \times 1.435e^{1.435(3)}$

$P'(3) = 10629$ bacteria/hr.

d.) $P(t) = 100e^{kt}$

$\frac{10{,}000}{100} = \frac{\cancel{100}e^{1.435t}}{\cancel{100}}$

$100 = e^{1.435t}$

$e^{1.435t} = 100.$

$\frac{\cancel{1.435}t}{\cancel{1.435}} = \frac{\ln 100}{1.435}$

$t = 3.20$ hrs

3.8 #6

EMPIRE

Laquan Drummer
Sai Jangirdar
Fabian Best

3.8 #6

$AP_{(0)}e^{KT}$ $\qquad 76e^{KT}$

$P_{(10)}e^{KT}$ $\qquad 76e^{10k} = \frac{1}{10}\ln\frac{92}{76} = .0191055237$

$P = ?$ $\qquad P = 513.519$

$Q = 76$

$R\ .0191055237$

$T = 100$

$\frac{1}{10}\ln\frac{250}{227}$

b $\quad P = ?$ $\qquad .0096510 9$

$Q = 227$

$R\ .0096510 9\ldots$

$T = 20$ $\qquad P = 275$

1900	76
1910	92
1920	106
1930	123
1940	131
1950	150
1960	179
1970	203
1980	227
1990	250
2000	275

c The "b" function is reasonable because it comes closest to the actual data.

Calculator

$\boxed{\text{Math}} \rightarrow \boxed{\text{solver}}$ $\qquad P - Qe^{(RT)}$

$P =$ $\boxed{\text{Alfa}}$ enter

3.8

#9

CIUARC

a) $10(3) - 0.83(3)^2$

$h = 22.53$

$h = 10t - .83t^2$

$\frac{dt}{dx} = 10 - 1.66t$

$10 - 1.66(3)$

Velocity $= 5.02$ m/s

$V = 10$ m/s

@ t secs

$h = 10t - .83t^2$

b) $10 - 1.66(3.54) = 4.12$ m/s

$25 = 10t - .83t^2$

$t = 3.54$ *

* USED SOLVER

3.8 #10

10. Math O $P - Qe^{(RT)} = 0$

a. $P = 94.5$	b. $P = 50$	c. $P = 20$
$Q = 100$	$Q = 100$	$Q = 100$
$R = -.0019$	$R = -.0019$	$R = .056$
$T = 28.45$	$T = 348.59$	$T = 28.45$

We Love Math

Jessica

Stephania

Krystina

3.8
#15

Diesel

#15 Section 3.8 Connor Payne Stanley Tucker Tyler Ferst

initial temp: 5°
Room temp: 20°
25 min in room: 10°

P = 20 - 10 = 10° To find R at first you need
Q = 20 - 5 = 15° to plug in P, Q, and T then
R = ? hit $\boxed{\text{Alpha}}$ $\boxed{\text{Enter}}$
T = 25 min

R = -.01621

A) Temp after 50 min of Drink

P = ?
Q = 20° - 5° = 15° Plug in 50 min for T with
R = -.01621 your new rate of -.01621 then
T = 50 min hit $\boxed{\text{Alpha}}$ $\boxed{\text{Enter}}$ for P

$P = 6.\overline{66}$ Subtract your P from the Temperature of the room to find Temperature of object.

$20 - 6.66 = 13.\overline{3}$

When will Temp = 15°

B) P = 20 - 15° = 5°
Q = 20 - 5 = 15°
R = -.01621
T = $\boxed{\text{Alpha}}$ $\boxed{\text{Enter}}$ 67.74... min