P. 1

NON CALCULATOR

① $3^3 \cdot 27$
$3^3 \cdot 3^3$
$\boxed{3^6}$

② $81 \cdot 9$
$3^4 \cdot 3^2$
$\boxed{3^6}$

③ $12(2^x)$
$12(2^3)$
$12(8)$
$\boxed{96}$

④ $1024\left(\frac{1}{2}\right)^x$
$1024\left(\frac{1}{2}\right)^3$
$1024\left(\frac{1}{8}\right)$
$\frac{1024}{8}$
128

⑤ $7^{-3} = \frac{1}{7^3} = \frac{1}{343}$

⑥ $19^0 = 1$

⑦ $27^{4/3} = (27^{1/3})^4 = (3)^4 = 81$

⑧ $25^{-3/2} = (25^{1/2})^{-3} = (5)^{-3} = \frac{1}{5^3} = \frac{1}{125}$

⑨ $81^{-3/4} = (81^{1/4})^{-3} = (3)^{-3} = \frac{1}{3^3} = \frac{1}{27}$

⑩ $121^{1/4} \cdot 121^{1/4} = 121^{2/4} = 121^{1/2} = 11$

⑪ $8^{5/2} \cdot 8^{1/2} = 8^{6/2} = 8^3 = 512$

⑫ $\frac{16^{5/2}}{16^2} = 16^{5/2 - 2} = 16^{5/2 - 4/2} = 16^{1/2} = 4$

⑬ $8^{5/3} \cdot 8^{-5/3} = 8^0 = 1$

⑭ $\frac{36^{7/4}}{36^{5/4}} = 36^{2/4} = 36^{1/2} = 6$

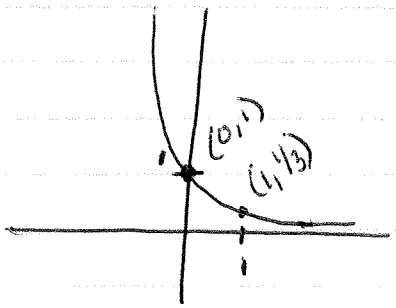
⑮ $(4^6)^{1/3} = 4^{6/3} = 4^2 = 16$

⑯ $(125^{1/4})^{4/3} = 125^{\frac{4}{12}}$
$= 125^{1/3}$
$= 5$

P.2

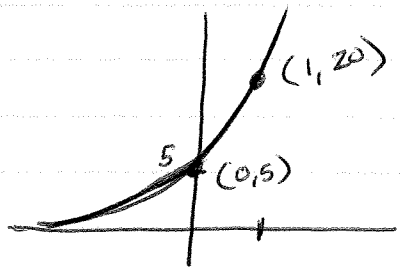
(17) $y = \left(\frac{1}{3}\right)^x$

y-intercept = $a = 1$
decay since $\frac{1}{3} < 1$



(18) $y = 5 \cdot 4^x$

y-intercept = $a = 5$
growth since $4 > 1$



(19) Increase 8% per year $\Rightarrow$ $b = 1.08$

$y = 1900(1.08)^x$

x = # of years since you purchased the painting
y = value of painting x years later

(20) decrease 12% per year $\Rightarrow$ $b = .88$

$y = 24000(.88)^x$

x = # of years you own the car
y = value of car x years after you bought it

WITH CALCULATOR

① (a) $y = 438000\ (1.03)^t$

(b) In 1995 $t = -5$ ... $y = 438000\ (1.03)^{-5} \approx \$377823$

In 2010 $t = 10$ ... $y = 438000\ (1.03)^{10} \approx \$588{,}635$

② Eliminated @ 4% means the decay factor is 96% or .96

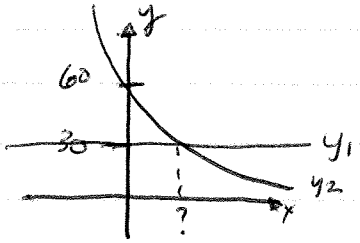
a) $y = 60\ (.96)^x$

b) after 10 hours $\Rightarrow x = 10$ ... $y = 60\ (.96)^{10} \approx 39.890$ grams left

c) ½ the medication would be 30g

Solve this → $30 = 60\ (.96)^x$

Graph $y_1 = 30$ and $y_2 = 60\ (.96)^x$



↓

FIND x-value of intersection

$x \approx 16.980$ hours

d) SKIP

P. 4

~~X~~ SKIP

4) Use Calculator ... Years 0, 1, 2, 3, 4, 5, 6 in L1
Debt 3985, 4338, 4918, 5870, 6640, 7598, 8774 in L2

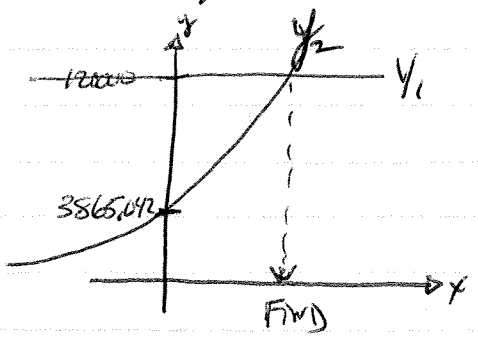
Run ExpReg ... $y = 3865.042(1.145)^x$
x = # of yrs after 1980

5) 1995 means $x = 15$
$y = 3865.042(1.145)^{15} \approx$ ~~29460.25609~~ \$29460.26

6) 1975 means $x = -5$
$y = 3865.042(1.145)^{-5} \approx 1963.933527$
\$1963.93

7) \$120,000 of Debt means solve this $120{,}000 = 3865.042(1.145)^x$

graph $Y_1 = 120{,}000$
$Y_2 = 3865.042(1.145)^x$



x-value of intersection

$X \approx 25.37224182$
over 25 years after 1980
≈ 2006

8) Compounded monthly ⇒ use $B = P\left(1+\frac{r}{n}\right)^{nt}$

$n = 12$

5% interest ⇒ $\boxed{r = .05}$

$B = 1500\left(1+\frac{.05}{12}\right)^{12\cdot 2}$

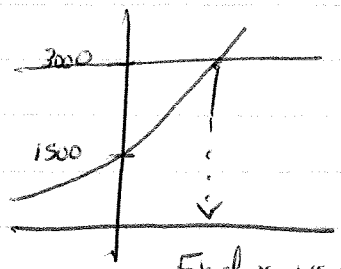
$1500\left(1+\frac{.05}{12}\right)^{24} \approx \$1657.41$

9) money Doubles ⇒ $B = 3000$

Solve $3000 = 1500\left(1+\frac{.05}{12}\right)^{x}$

graph $y_1 = 3000$

$y_2 = 1500\left(1+.05/12\right)^{x}$ → total # of months!



Find x-value of intersection

$x \approx 166.7016567$

↓

This is the # of months!

13.892 years

10) Compounded continuously → use $B = Pe^{rt}$

$r = .045$

$t = 3$

$B = 1500e^{(.045)(3)} = 1500e^{.135} \approx \$1716.81$

(11) $y = 100e^{-.0308x}$

~~X~~ SKIP

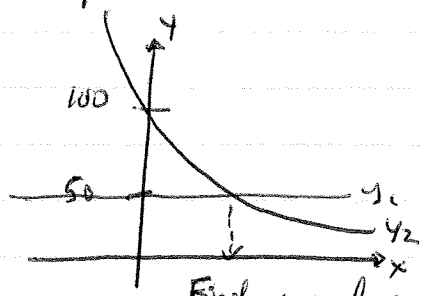
~~X~~ SKIP

c) Reduced by $\frac{1}{2}$ means $y = 50$

Solve $50 = 100e^{-.0308x}$

graph $y_1 = 50$

$y_2 = 100e^{-.0308x}$



Find x-value of intersection

$x \approx 22,505$ hours

(12) ~~X~~ SKIP

b) In 1965 ~~Second~~ $x = 5$ $y = 204$

In 1970 $x = 10$ $y = 346$

STEP 1 Write as an exponential equation $y = ab^x$

$204 = ab^5$

$346 = ab^{10}$

STEP 2 Solve for a in the equation w/ smallest exponent.

$\frac{204}{b^5} = a$

12 continued

STEP 3 Plug a into other equation ...

$$346 = a\,b^{10}$$

$$346 = \left(\frac{204}{b^5}\right) b^{10}$$

$$346 = \frac{204}{b^5} \cdot \frac{b^{10}}{1}$$

$$346 = \frac{204\,b^{10}}{b^5}$$

$$346 = 204\,b^5$$

~~Divide both~~

GET b^5 by itself

$$\frac{346}{204} = b^5$$

Raise Both Sides to the $\frac{1}{5}$ power to get b by itself.

$$\left(\frac{346}{204}\right)^{1/5} = b$$

$$1.11144896 \approx b$$

STEP 4 ~~Also~~ Plug this value of b into equation for a from Step 2 ...

$$a = \frac{204}{b^5} = \frac{204}{1.11144896^5} \approx 120.2774567$$

12 continued

STEP 5 WRITE EQUATION ...

$$y = 120.277(1.111)^x$$

(12c) Put Years = 0, 5, 10, 15, 20, 25, 30 in L1

Health Care Exp = 143, 204, 346, 592, 1064, 1701, 2601 in L2

Run ExpReg ...

$$y = 133.005(1.106)^x$$

(12d) In 1957, $x = -3$

$$y = 133.005(1.106)^{-3} \approx 98.311$$

In 2003, $x = 43$

$$y = 133.005(1.106)^{43} \approx 10123.680$$