PREC12 Name_____

Quiz7.3(F)

1. Solve each equation without graphing:

a) $27^x = 9^{2x-1}$

$3^{3x} = 3^{4x-2}$

$\therefore 3x = 4x - 2$

$-x = -2$

$x = 2$

b) $4^{8x} = \frac{1}{16}$

$4^{8x} = 4^{-2}$

$\therefore 8x = -2$

$x = -1/4$

c) $\frac{8^{x+6}}{16^{2x-1}} = 32^{3x-4}$

$\frac{2^{3x+18}}{2^{8x-4}} = 2^{15x-20}$

$2^{-5x+22} = 2^{15x-20}$

$\therefore -5x + 22 = 15x - 20$

$-20x = -42$

$x = 2.1$

2. A bacterial culture starts with 3000 bacteria. After 3 hours it has grown to 48 000. What is the doubling period for this culture? (Solve without graphing)

$48000 = 3000(2)^{3/n}$

$16 = 2^{3/n}$

$2^4 = 2^{3/n}$

$\therefore 4 = 3/n$

$n = 3/4$

3/4 hour

3. Once inside the human body, a particular virus doubles every 9 minutes. The first symptoms of infection occur when there are about 8^{23} of these viruses present in the body. If a person is infected with a single virus now, how long will it take for the first symptoms to occur? (Solve without graphing)

$8^{23} = 1(2)^{t/9}$

$(2^3)^{23}$

$2^{69} = 2^{t/9}$

$\therefore 69 = t/9$

$t = 9 \cdot 69$

$= 621$ minutes

4. Determine the final value of each investment:

a) $5000 at 6%/$a$ compounded monthly for 3 years

$= 5000\left(1 + \frac{.06}{12}\right)^{36}$

$= \$5983.40$

b) $5000 at 6%/$a$ compounded bi-weekly for 3 years

$= 5000\left(1 + \frac{.06}{26}\right)^{78}$

$= \$5984.85$

c) $2000 at 4.5%/$a$ compounded quarterly for 5 years

$= 2000\left(1 + \frac{.045}{4}\right)^{20}$

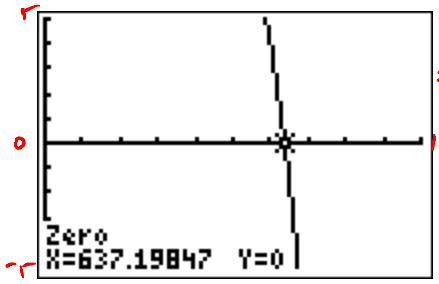
$= \$2501.50$

5. For each scenario in question 4 above, determine how long (tenth of a year) it will take for each investment to grow to $120 000.

a) $120000 = 5000(1.005)^n$

$24 = 1.005^n$

$0 = 24 - 1.005^n$



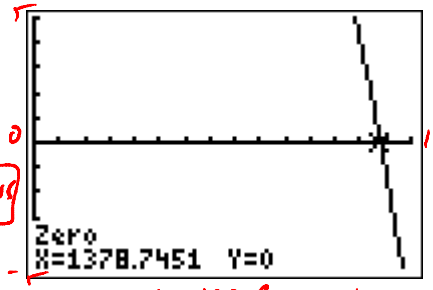
$n = 637.19847$

$\div 12$

$= 53.1$ years

b) $24 = \left(1 + \frac{.06}{26}\right)^n$

$0 = 24 - \left(1 + \frac{.06}{26}\right)^n$



$n = 1378.7451$

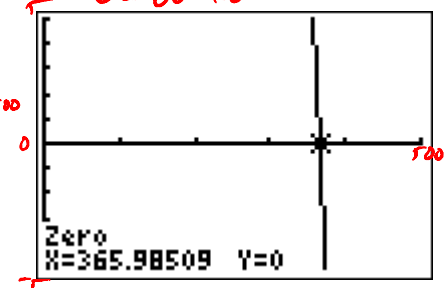
$\div 26$

$= 53.0$ years

c) $120000 = 2000\left(1 + \frac{.045}{4}\right)^n$

$60 = 1.0112^n$

$0 = 60 - 1.0112^n$



$n = 365.98509$

$\div 4$

$= 91.5$ years

6. An element has a half-life of 5 hours.

a) What percent of an original amount remains after 4 days?

$= 96$ hrs

$F = 100\left(\frac{1}{2}\right)^{96/5}$

$= 1.66 \times 10^{-4}$

$= 0.00017\%$

b) How long will it take until only 20% of an original amount remains?

$20 = 100\left(\frac{1}{2}\right)^{t/5}$

$0.2 = 0.5^{t/5}$

$0 = 0.2 - 0.5^{t/5}$

$t = 11.6$ hours