

$$1. a) 5^{-3} = \frac{1}{5^3} = \frac{1}{125}$$

$$b) \left(\frac{9}{16}\right)^{-2} = \frac{1}{\frac{9}{16}} = 1 \div \frac{9}{16}$$

$$\Rightarrow 1 \times \frac{16}{9} = \frac{16}{9} \Rightarrow 1\frac{7}{9}$$

$$c) (5 \times 3)^2 = (15)^2 = 225$$

$$5^2 \times 3^2 = 225$$

$$d) (4a^3)^2 = 4^2 \times (a^3)^2$$

$$= 16a^6$$

$$e) (3m^{\frac{1}{2}})^4$$

$$= 3^4 \times m^{(\frac{1}{2})^4}$$

$$\Rightarrow 81 \times m^2$$

$$\Rightarrow 81m^2$$

$$f) (27p^3q^5r^{-1})^{-\frac{1}{3}}$$

$$\Rightarrow \frac{27^{\frac{1}{3}} \times p^{3(\frac{1}{3})} \times q^{(5 \times \frac{1}{3})}}{r^{\frac{1}{3}}} \Rightarrow \frac{9 \times p \times q^2}{r^{\frac{1}{3}}}$$

$$\Rightarrow 9pq^2r^{-\frac{1}{3}}$$

$$2. a) \log_x 49 = 2$$

$$x^2 = 49$$

$$x = \sqrt{49}$$

$$x = 7$$

$$b) \log_6 216 = x$$

$$6^x = 216$$

$$6^x = 6^3$$

$$x = 3$$

$$c) \log |x| = 15$$

$$10^{15} = |x|$$

$$x = \pm 10^{15}$$

$$d) \log \sqrt{10} = x \Rightarrow \log_{10} 10^{\frac{1}{2}} = x$$

$$\Rightarrow 10^x = 10^{\frac{1}{2}}$$

$$x = \frac{1}{2}$$

3. You invest \$.2500 in an account paying 5% compounded quarterly for six ~~more~~ years. How much will be in the account at the end of time period.

$$A = P(1 + \frac{r}{n})^{nt}$$

A = Total Amount

P = Amount invested = 2500

r = Annual rate = 5%

n = Number of times = 4

t = Time in years = 6 years

$$A = 2500(1 + \frac{5}{400})^{4 \times 6}$$

$$= 2500(1.034735105)$$

$$= \underline{\underline{\$3368.377626}}$$

4) You invest \$.1000 in an account paying 6% compounded Monthly. How long will it take to double your investment.

$$A = P \left(1 + \frac{r}{n}\right)^{nt}$$

$$A = 2000$$

$$P = 1000$$

$$r = 6\%$$

$$n = 12$$

$$t = ?$$

$$2000 = 1000 \left(1 + \frac{6}{1200}\right)^{12t}$$

$$2 = \left(1 + \frac{6}{1200}\right)^{12t}$$

$$2 = (1.005)^{12t}$$

$$\log 2 = 12t + \log 1.005$$

$$\log 2 - \log 1.005 = 12t$$

$$\log (2 - 1.005) = 12t$$

$$\frac{138.975}{12} = \frac{12t}{12}$$

$$11.583 = t$$

$$\text{Time} = 11.6 \text{ years}$$

5) The half-life of a radioactive isotope is 8 days. If 3.6 kg are present now, how much will be present in t days? How much will be present in 22 days?

$$Y = Y_0 e^{kt}$$

$$1.8 = 3.6 e^{8k}$$

$$\frac{1.8}{3.6} = e^{8k}$$

$$\frac{1}{2} = e^{8k}$$

Apply $\ln$ on each side

$$\ln \frac{1}{2} = \ln e^{8k}$$

$$\ln \frac{1}{2} = 8k \ln e$$

$$\frac{\ln \frac{1}{2}}{8} = k(1)$$

$$-0.0866 = k$$

Substitute k in $Y = Y_0 e^{kt}$

$$Y = Y_0 e^{-0.0866t}$$

$$Y = 3.6 e^{-0.0866t}$$

$$3.6 e^{-0.0866t} \text{ kg will be present in } t \text{ days}$$

Substitute 22 days for t in $Y = 3.6 e^{-0.0866(22)}$

$$Y = 3.6 e^{-1.9056}$$

$$Y = 0.535$$

0.535 kg will be present in 22 days