

3.5 Growth

$$y = a e^{bx}$$

Decay

$$y = a e^{-bx}$$

$$A = P e^{rt}$$

A = ending
amount

P initial
amount
r rate
t time

1. \$5000 7%

$$A = Pe^{rt}$$

$$\frac{10000}{5000} = \frac{5000}{5000} e^{.07t}$$

$$2 = e^{.07t}$$

$$\ln 2 = \ln e^{.07t}$$

$$\frac{.6931}{.07} = \frac{.07t}{.07}$$

$$9.90 = t \quad 9.9 \text{ years to double}$$

$$A = 5,000 e^{.07(10)}$$

Calc

$$A = \$10,068.76$$

3. \$ 500 10 yrs double

$$A = P e^{rt}$$

$$\frac{1000}{500} = \frac{500 e^{r(10)}}{500}$$

$$2 = e^{10r}$$

$$\ln 2 = \ln e^{10r}$$

$$.6931 = 10r$$

$$.06931 = r$$

6.9%

$$A = 500 e^{.0693(10)}$$

10 years

$$A = \$999.85$$

$$5. \quad \$1000 \quad 2281.88 \quad 10 \text{ yrs}$$

$$A = Pe^{rt}$$

$$\frac{2281.88}{1000} = \frac{1000}{1000} e^{r(10)}$$

$$2.28188 = e^{10r}$$

$$\ln 2.28188 = \ln e^{10r}$$

$$\frac{.825}{10} = \frac{10r}{10}$$

$$.0825 = r$$

$$8.25\%$$

$$A = Pe^{rt}$$

$$\frac{2000}{1000} = \frac{1000}{1000} e^{.0825t}$$

$$2 = e^{.0825t}$$

$$\ln 2 = \ln e^{.0825t}$$

$$\frac{.6931}{.0825} = \frac{.0825t}{.0825}$$

$$8.40 = t$$

8.4 yrs to double

11. 1599 yrs 4g

$$A = Pe^{rt}$$

$$\frac{2}{4} = \frac{4}{4} e^{r(1599)}$$

$$\frac{1}{2} = e^{1599r}$$

Half life

4g

2g

$$\ln \frac{1}{2} = \ln e^{1599r}$$

$$\frac{-0.6931}{1599} = \frac{1599r}{1599}$$

$$y = ae^{-bx}$$

$$-4.33 \times 10^{-4} = r$$

$$-0.000433 = r$$

$$A = Pe^{rt}$$

$$A = 4e^{-0.000433(1000)}$$

Calc

$$A = 2.59 \text{ g}$$

13. 5715 half-life

$$A = Pe^{rt}$$

$$\frac{1}{2} = e^{rt}$$

$$\frac{1}{2} = e^{r(5715)}$$

$$\ln \frac{1}{2} = \ln e^{5715r}$$

$$\frac{-0.6931}{5715} = \frac{5715r}{5715}$$

$$-0.00012129 = r$$

$$A = Pe^{rt}$$

$$y = ae^{-bx}$$

$$3.5 = Pe^{-0.00012129(1000)}$$

$$3.5 = P(.8858)$$

$$\frac{3.5}{.8858} = P$$

$$3.95 = P$$

$$3.95g$$

$$29. \quad R = \frac{1}{8^{14}}$$

$$10^{12} \cdot \frac{e^{-t/8223}}{10^{12}} = \frac{1}{8^{14}} \cdot 10^{12}$$

$$e^{-t/8223} = \frac{10^{12}}{8^{14}}$$

$$\ln e^{-t/8223} = \ln \frac{10^{12}}{8^{14}}$$

$$8223 \cdot \frac{-t}{8223} = -1.481 \cdot 8223$$

$$-t = -12180$$

$$t = 12,180$$

45. Exp Reg

$$y = a^{bx}$$

$$y = 41.04 (1.077)^x$$

Logistic

$$y = \frac{105.294}{1 + 2.014e^{-.28x}}$$