23. Suppose you deposit $1000 in an account paying 2% annual interest, compounded continuously, how many years would It take for your account to be worth $2000?

$$A = Pe^{rt}$$

$$\frac{2000}{1000} = \frac{1000e^{.02t}}{1000}$$

$$2 = e^{.02t}$$

$$\ln 2 = \ln e^{.02t} \rightarrow .02t \boxed{\ln e}$$

$$\frac{\ln 2}{.02} = \frac{.02t}{.02}$$

$$34.657 \text{ yrs} \approx t$$

34.6

21. Suppose you deposit $500 in an account paying 1.5% annual interest, compounded continuously, what is the balance after 5 years?

$$A = 500e^{.015(5)}$$

$$A \approx \$538.94$$

16. $-2e^{3x} + 12 = -48$

$$-2e^{3x} = -60$$

$$e^{3x} = 30$$

$\ln(30)/3$

$$\ln e^{3x} = \ln 30$$

$$3x = \ln 30$$

$$x = \frac{\ln 30}{3}$$

$$x \approx 1.1337$$

19. $\ln(7x - 4) = -0.3$

$$e^{-.3} = 7x - 4$$

$$e^{-.3} + 4 = 7x$$

$$\frac{(e^{-.3} + 4)}{7} = x$$

$$x \approx .6773$$

Exponential Growth: $y = a(1+r)^t$ $\quad y=a(b)^x \quad b>1$

Exponential Decay: $y = a(1-r)^t$ $\quad y=a(b)^x \quad 0<b<1$

Where y is the amount of a quantity that exists/remains after t time periods given an initial amount a and r is the percent of increase/decrease expressed as a decimal.

1. A cup of coffee contains 130 milligrams of caffeine. If caffeine is eliminated from the body at a rate of 11% per hour, how long will it take for half of this caffeine to be eliminated?

$$y = a(1-r)^t$$

$$\frac{65}{130} = \frac{130(1-.11)^t}{130}$$

$$.5 = .89^t$$

OR

$$\ln .5 = \ln .89^t \qquad \log .5 = \log .89^t$$

$$\frac{\ln .5}{\ln .89} = \frac{t \ln .89}{\ln .89} \qquad \frac{\log .5}{\log .89} = \frac{t \log .89}{\log .89}$$

$t \approx 5.948$ hrs

5.95

5.9

6