13. $3e^{-2x} - 5 = 4$

$3e^{-2x} = 9$

$e^{-2x} = 3$

$\ln e^{-2x} = \ln 3$

$-2x \ln e$

$-2x(1)$

$-2x = \ln 3$

$x = \frac{\ln 3}{-2}$

$x \approx -.5493$

$\ln(3)/-2$

18. $\ln(3x+4) = -7$

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

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

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

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

$(e^{\wedge}(-7)-4)/3$

$x \approx -1.3330$

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?

$$A = Pe^{rt}$$

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

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

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

$$\ln 2 = .02t$$

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

$t = 34.6574$ yrs

34.7

35

Section 9.6 - Exponential Growth and Decay

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.

2. In 1910, the population of a city was 120,000. Since then, the population has increased by 1.5% per year. If the population continues to grow at this rate, what will the population be in 2010?

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

$y = 120{,}000(1+.015)^{100}$

$y = 120{,}000(1.015)^{100}$

$y = 531{,}845$ people

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?

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

$\log_b m^p = p\log_b m$

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

$$.5 = .89^t$$

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

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

$t \approx 5.948$ hrs

5.95

5.9

6