MA180 Professor Katiraie Quiz 4 Form A Spring 2007

Name________________________________

Solve the equation.

1) $\log_3 x - \log_3(x - 24) = 4$

$$\log_3\left(\frac{X}{X-24}\right) = 4 \quad 3^4 = \frac{X}{X-24} \Rightarrow \frac{81}{1} = \frac{X}{X-24}$$

$$81X - 1944 = X$$

$$80X = 1944 \Rightarrow \boxed{X = 24.3}$$

Solve the problem.

2) A fossilized leaf contains 45% of its normal amount of carbon 14. How old is the fossil (to the nearest year)? Use 5600 years as the half-life of carbon 14.
(Hint: First use the 5600 years to solve for K)

$$A = A_0 e^{Kt}$$

$$\frac{1}{2} = 1 e^{5600K}$$

$$\ln\frac{1}{2} = 5600K$$

$$\frac{\ln\frac{1}{2}}{5600} = K$$

$$-1.238 \times 10^{-4} = K$$

$$A = A_0 e^{Kt}$$

$$0.45 = 1 e^{-1.238 \times 10^{-4} t}$$

$$\ln 0.45 = -1.238 \times 10^{-4} t$$

$$\frac{\ln 0.45}{-1.238 \times 10^{-4}} = t$$

$$6449.98 = t$$

$$6450 \approx t \text{ years}$$

Solve the exponential equation. Express the solution set in terms of natural logarithms.

3) $e^{2x + 6} = 4$

$$\ln 4 = 2x + 6$$

$$(\ln 4) - 6 = 2x \Longrightarrow x = \frac{(\ln 4) - 6}{2} = \boxed{-2.31}$$

Solve the problem.

4) The size P of a small herbivore population at time t (in years) obeys the function $P(t) = 600e^{0.16t}$ if they have enough food and the predator population stays constant. After how many years will the population reach 3600?

$$3600 = 600e^{0.16t}$$

$$6 = e^{0.16t}$$

$$\ln 6 = 0.16t \Longrightarrow t = \frac{\ln 6}{0.16} = 11.198$$

$$\boxed{\approx 11 \text{ years}}$$

Solve the equation.

5) $2 + \log_3(4x + 5) - \log_3 x = 4$

$-2 \qquad -2$

$$\log_3(4x+5) - \log_3 x = 2$$

$$\log_3\left(\frac{4x+5}{x}\right) = 2$$

$$\frac{4x+5}{x} = 3^2$$

$$\frac{4x+5}{x} = \frac{9}{1}$$

$$4x + 5 = 9x$$

$$5 = 5x$$

$$\boxed{1 = x}$$

MA180 Professor Katiraie Quiz 4 Form B Spring 2007

Name________________________

Solve the equation.

1) $\log_3 x + \log_3 (x - 24) = 4$

$\log_3 x(x-24) = 4$

$x^2 - 24x = 81$

$x^2 - 24x - 81 = 0$

$(x-27)(x+3) = 0$

$\boxed{x = 27}$ $\cancel{x = -3}$

Solve the problem.

2) A fossilized leaf contains 28% of its normal amount of carbon 14. How old is the fossil (to the nearest year)? Use 5600 years as the half-life of carbon 14.
(Hint: First use the 5600 years to solve for K)

$A = A_0 e^{Kt}$

$\frac{1}{2} = 1 e^{5600K}$

$\ln\left(\frac{1}{2}\right) = 5600K$

$K = \frac{\ln\left(\frac{1}{2}\right)}{5600}$

$\boxed{K = -1.238 \times 10^{-4}}$

$A = A_0 e^{Kt}$

$0.28 = 1 e^{-1.238 \times 10^{-4} t}$

$\ln 0.28 = -1.238 \times 10^{-4} t$

$\boxed{10282 \text{ years} = t}$

Solve the exponential equation. Express the solution set in terms of natural logarithms.

3) $e^{x+6} = 4$

$\ln 4 = x+6 \Longrightarrow x = \ln 4 - 6 \cong \boxed{-4.61}$

Solve the equation.

4) $2 + \log_3(2x + 5) - \log_3 x = 4$

$\log_3\left(\frac{2x+5}{x}\right) = 2$

$\frac{2x+5}{x} = \frac{9}{1}$

$9x = 2x+5$

$7x = 5 \Longrightarrow \boxed{x = \frac{5}{7}}$

Solve the problem.

5) The size P of a small herbivore population at time t (in years) obeys the function $P(t) = 600e^{0.16t}$ if they have enough food and the predator population stays constant. After how many years will the population reach 3000?

$\frac{3000}{600} = \frac{600e^{0.16t}}{600}$

$5 = e^{0.16t}$

$\ln 5 = 0.16t$

$t = \frac{\ln 5}{0.16} = 10.059 \approx \boxed{10 \text{ years}}$