MTH 166, Quiz #5, Fall 2017 Name KEY

Instructions: Show all work. Use exact answers unless otherwise asked to round.

1. Expand the expression $\log\left(\frac{\sqrt[4]{x}y^4}{z^5}\right)$ as much as possible.

$\frac{1}{4}\log x + 4\log y - 5\log z$

2. Combine the expression $\frac{1}{2}[5\ln(x+6) - \ln x - \ln(x^2 - 25)]$ into a single logarithmic expression.

$\ln\sqrt{\frac{(x+6)^5}{x(x^2-25)}}$

3. Solve each equation for x.
   a. $e^{4x} + 5e^{2x} - 24 = 0$

$u = e^{2x}$

$u^2 + 5u - 24 = 0$

$(u+8)(u-3) = 0$

$u = -8, u = 3$

$e^{2x} = -8$ no solution

$e^{2x} = 3$

$2x = \ln 3 \rightarrow \boxed{x = \frac{\ln 3}{2}}$

   b. $\log x + \log(x+3) = \log 10$

$\cancel{\log}[x(x+3)] = \cancel{\log} 10$

$x^2 + 3x - 10 = 0$

$(x+5)(x-2) = 0$

$\cancel{x = -5}$ $\ln(-5)$ not defined

$\boxed{x = 2}$

4. Use Newton's Law of Cooling $T = C + (T_0 - C)e^{kt}$ to solve: a pizza removed from the oven has a temperature of 450°F. It is left sitting in a room that has a temperature of 70°F. After five minutes the pizza is 300°F. Find a model for the temperature of the cooling pizza, and use that to find the temperature of the pizza after 20 minutes.

$T = 70 + (450 - 70)e^{kt}$

$300 = T = 70 + 380e^{k(5)} \rightarrow \frac{230}{380} = e^{k(5)}$

$\frac{\ln\left(\frac{230}{380}\right)}{5} = k \approx -1.0042$

$T = 70 + 380e^{-.10042t}$

$= 70 + 380e^{-.10042(20)} = 120.99\ldots$ $\boxed{121°}$