Math 121 – Quiz 4 Solution

1. Find the exact value of each logarithm without using a calculator.
   (a) $\log_2 32$
   (b) $\ln e^4$
2. Find the **exact** solution(s) to the following equation:

$$\ln x + \ln(x+2) = 4$$

Solution:

1. (a) $\log_2 32 = \log_2 2^5 = 5 \log_2 2 = 5$
   (b) $\ln e^4 = 4 \ln e = 4$
2.

$$\begin{aligned} \ln x + \ln(x+2) &= 4 \\ \ln[x(x+2)] &= 4 \\ x(x+2) &= e^4 \\ x^2 + 2x - e^4 &= 0 \\ x &= \frac{-2 \pm \sqrt{2^2 - 4(1)(-e^4)}}{2(1)} \\ x &= \frac{-2 \pm \sqrt{4 + 4e^4}}{2} \\ x &= -1 \pm \sqrt{1 + e^4} \end{aligned}$$

Since the domain of $\ln x$ is all positive reals, $\boxed{x = -1 + \sqrt{1 + e^4}}$.