Math 111 Quiz #5 Solutions

1. (a) $f(x) = e^x$ is graph $\boxed{\text{I}}$ since $e \approx 2.71828$ is less than 5. (This means e^x grows less quickly than 5^x even though they both have an initial value of 1.)

   (b) $g(x) = 5^x$ is graph $\boxed{\text{II.}}$

   (c) $h(x) = 3e^x$ is graph $\boxed{\text{III}}$ since the initial value is 3. (y-intercept is (0,3))

2. $\log_5 125 = \boxed{3}$ (since $5^3 = 125$)

3. (a) Since $P(1) = 100e^{0.5(1)} \approx 164.8721$, the population will be $\boxed{\text{165 bunnies.}}$

   (b) The population will be doubled when $2 = e^{0.5t}$. $\Rightarrow$ $\ln 2 = 0.5t$

   $\Rightarrow$ $t = \frac{\ln 2}{0.5} = 2\ln 2$ $\boxed{\approx 1.3863 \text{ years}}$

4. Taking log (or natural log) of both sides:

$$\log(9^x) = \log(7776(1.5)^x)$$

$$x \cdot \log 9 = \log 7776 + \log 1.5^x$$

$$x \cdot \log 9 = \log 7776 + x \cdot \log 1.5$$

$$x \cdot \log 9 - x \log 1.5 = \log 7776 \quad \text{(Getting terms with } x \text{ on one side of the equation.)}$$

$$x(\log 9 - \log 1.5) = \log 7776$$

$$\boxed{x = \frac{\log 7776}{\log 9 - \log 1.5} = 5}$$

Note: There is more than one way to begin this problem, but in the end, you should always get $x = 5$.