Name: Solutions
Section 1.6 - In class example
Math 151 − Spring 2018

1. Solve the following equations

   (a) $2 = 1.02^t$

$$\ln(2) = \ln(1.02^t) = t\ln(1.02)$$

$$t = \frac{\ln(2)}{\ln(1.02)}$$

   (b) $5e^{3t} = 8e^{2t}$

$$\frac{5}{8}e^{3t} = e^{2t} \cdot \frac{8}{5} \qquad \text{divide on both sides by } e^{2t}$$

$$\frac{e^{3t}}{e^{2t}} = \frac{8}{5} \quad \Rightarrow \quad e^t = \frac{8}{5} \quad \Rightarrow \quad \ln(e^t) = \ln\left(\frac{8}{5}\right)$$

$$t = \ln\left(\frac{8}{5}\right)$$

2. The gross world product is $W = 32.4(1.036)^t$, where W is in trillions of dollars and t is time in years since 2001. Find a formula for the world gross world product using a continuous rate.

We want to write $\quad W = 32.4(1.036)^t \quad$ as $\quad 32.4e^{kt}$

so $\qquad 32.4(1.036)^t = 32.4(e^k)^t \quad \Rightarrow \quad e^k = 1.036$ so

$$k = \ln(1.036) = 0.035$$

continuous!

This means the world gdp is growing at a rate of 3.5%

3. In 2011, the population of China and India were approximately 1.34 and 1.19 billion people, respectively. However, the growth rate in China is 0.4% while the population in India is growing by 1.37% per year. If the growth rates remain constant, how long will it take for the two countries to have equal populations.

China

$$1.34(1 + 0.004)^t$$

India

$$1.19(1 + 0.0137)^t$$

$$\frac{1.34(1.004)^t}{1.19} = \frac{1.19(1.0137)^t}{1.19}$$

$$\left(\frac{1.34}{1.19}\right)(1.004)^t = (1.0137)^t$$

$$\ln\left(\frac{1.34}{1.19}\right) + t\ln(1.004) = t\ln(1.0137)$$

solving ..

$$t = 12.34 \text{ yrs}$$