1. A population of ants grows logistically. Initially, the ant population is 10% of the carrying capacity. After 1 year, the ant population has doubled. Compute

   (a) The population (as a percentage of carrying capacity) after 2 years.

   (b) The time at which the population reaches 90% of carrying capacity.

   (c) The time at which the population is increasing fastest.

   Hint: recall the logistic equation $\frac{dy}{dt} = r(1 - (y/K))y$. Let $y(t)$ be the population of ants in units of carrying capacity, so that $K = 1$, $y(0) = 0.1$, and $y(1) = 0.2$.

2. Find an integrating factor $\mu(x)$ that depends only on x to solve

$$\frac{dy}{dx} = -\left(\frac{y\sin x + 2yx(\cos x)}{x\sin x}\right).$$

Hint: rewrite the equation in standard differential form. After transforming to an exact equation, try imposing $\psi_y = N$ first.

3. Compute the following.

(a) $\frac{3+2i}{4-i}$

(b) $(2+i)e^{1-\frac{\pi}{2}i}$