Differential Equations Homework - Find the general solutions and if initial conditions are given, find the specific solution.

1. $y' = 3xy^2$

2. $xy' = \dfrac{y}{2}$

3. Consider the equation $\dfrac{dP}{dt} = rP\left(1 - \dfrac{P}{K}\right)$ where $r > 0$ and $K > 0$ are constants.
   a. Find the general solution and simplify your answer.
   b. Find $\lim\limits_{t \to \infty} P(t)$
   c. Find all points of inflection for your solution $P(t)$.

4. $y' = \dfrac{y+1}{x}$ $y(0) = 5$

5. $y' + \dfrac{2}{x}y = 1$ $y(3) = 2$

6. $y' - y \tan x = \cos x$

7. $y' + y = x^2$

8. $y' + \dfrac{x}{2}y = \sin x$

9. $(1+x)y' + y = 0$ $y(0) = 2$