Differential Equations Worksheet

1. Solve the following separable differential equations:

   (a) $y' = \dfrac{y}{x^2 - 1}$.

   (b) $y^2 = y^2 y' = 6x - x^3$.

   (c) $y' = 5x^{2/3} y^4$.

   (d) $y' = \sqrt{x} e^{4y}$.

2. Solve the following linear differential equations:

   (a) $y' - 3y = 5$.

   (b) $y' = y + 2xe^{2x}$.

3. Recall that a *homogeneous* differential equation is one that can be written in the form $\frac{dy}{dx} = f\left(\frac{x}{y}\right)$; this type of equation is solved by making the substitution $v = \frac{y}{x}$. Solve the following homogeneous differential equations:

   (a) $y' = \frac{y^2 + 2xy}{x^2}$.

   (b) $2xyy' = (x^2 + y^2)$.

   (c) $y' = \frac{y(x^2 + y^2)}{xy^2 - 2x^3}$.