

Instructions: Work the problems below as directed. Show all work. Clearly mark your final answers. Use exact values unless the problem specifically directs you to round. Simplify as much as possible. Partial credit is possible, but solutions without work will not receive full credit.

1. Solve the separable differential equation $y' = xe^{x-y}$.

$$y' = xe^x e^{-y}$$

$$\int e^y y' = \int xe^x$$

$$e^y = (x-1)e^x + C$$

$$y = \ln|(x-1)e^x + C|$$

2. Find the component vector given the magnitude and the angle the vector makes with the positive x-axis: $\|\vec{v}\| = 5, \theta = 120^\circ$

$$5 \cos 120^\circ = -\frac{5}{2}$$

$$5 \sin 120^\circ = \frac{5\sqrt{3}}{2}$$

$$\vec{v} = -\frac{5}{2}\hat{i} + \frac{5\sqrt{3}}{2}\hat{j} \quad \text{or} \quad \left\langle -\frac{5}{2}, \frac{5\sqrt{3}}{2} \right\rangle$$

3. Find parametric equations for the line passing through (1,4) and (5,-2).

$$\Delta x = 5 - 1 = 4$$

$$\Delta y = -2 - 4 = -6$$

$$x = 4t + 1$$

$$y = -6t + 4$$