D. ZABSONRE

Section 2.5:

#16) $(1-x^3)\frac{dy}{dx} = 3x^2y$

$$\int \frac{dy}{y} = \int \frac{3x^2}{(1-x^3)}\,dx$$

$$\ln|y| = -\ln|1-x^3| + \ln c$$

$$\ln|y(1-x^3)| = \ln c$$

$$\Rightarrow y(1-x^3) = c \Rightarrow \boxed{y = \frac{c}{1-x^3}}$$

#36) $\frac{dP}{dt} + 2tP = P + 4t - 2$

$$\frac{dP}{dt} + (2t-1)P = 4t-2$$

$$\mu = e^{\int (2t-1)dt} = e^{t^2-t}$$

$$e^{t^2-t}\frac{dP}{dt} + (2t-1)e^{t^2-t}P = (4t-2)e^{(t^2-t)}$$

$$\left[e^{(t^2-t)}P\right]' = 2(2t-1)e^{t^2-t}$$

$$e^{(t^2-t)}P = 2\int (2t-1)e^{(t^2-t)}\,dt$$

$$= 2e^{t^2-t} + C$$

$$\Rightarrow P = 2 + \frac{C}{e^{t^2-t}} = 2 + Ce^{t-t^2}, \quad -\infty < t < \infty$$

Section 2.5 — D. BADDAWI

45) $xy' + y = e^x$, $y(1) = 2$

$y' + \frac{1}{x}y = \frac{e^x}{x}$

$\mu = e^{\int \frac{1}{x} dx} = e^{\ln x} = x$

$\Rightarrow xy' + y = e^x$

$(xy)' = e^x$

$xy = e^x + C$

$y = \frac{e^x}{x} + \frac{C}{x}$, $y(1) = 2$

$2 = e + C \Rightarrow C = (2 - e)$

$\therefore \boxed{y = \frac{1}{x}(e^x + 2 - e)}$