MATH 16020: Applied Calculus 2 Quiz 9 (Solutions) Mon, Mar. 20, 2023

Please show **all** your work! Answers without supporting work will not be given credit. Write answers in spaces provided.

Name:____

1. [**5 pts**] What is the **integrating factor** of the following differential equation?

$$2y' + \left(\frac{6}{x}\right) y = 10\ln(x)$$

Solution: First get the differential equation in Standard Form. i.e.

$$y' + \left(\frac{3}{x}\right) y = 5\ln(x) \qquad \textbf{[1 pt]}$$

So $P(x) = \dfrac{3}{x}$ [**1 pt**].

Hence,

$$u(x) = \exp\left[\int P(x)\,dx\right] = \exp\left[\int \frac{3}{x}\,dx\right] = \exp\left[3\ln(x)\right] = \exp\left[\ln(x^3)\right] = x^3 \qquad \textbf{[2 pts]}$$

2. [**5 pts**] What is the **integrating factor** of the following differential equation?

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

Solution: First get the differential equation in Standard Form. i.e.

$$\frac{dy}{dx} - \frac{2(x^2+x)}{x+1}y = e^{x^2} \qquad \textbf{[1 pt]}$$

So $P(x) = -\dfrac{2(x^2+x)}{x+1} = -\dfrac{2x(x+1)}{x+1} = -2x$ [**1 pt**].

Hence,

$$u(x) = \exp\left[\int P(x)\,dx\right] = \exp\left[\int -2x\,dx\right] = \exp\left[-x^2\right] = e^{-x^2} \qquad \textbf{[2 pts]}$$