

Math 202 – Quiz # 2b

Name: _____

Ser. # _____

1. Solve the following differential equations: $\frac{dy}{dx} = 1 + x^2 + y^2 + x^2 y^2$

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

$$= (1+y^2)(x^2+1)$$

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

$$\tan^{-1} y = \frac{1}{3}x^3 + x + C$$

$$y = \tan\left(\frac{x^3}{3} + x + C\right)$$

2. Solve the following initial value problems:

(a) $y' = xy - x$, $y(1) = 0$.

$$\frac{dy}{dx} - xy = -x \quad [\text{Linear}] \quad \text{Also separable}$$

$$P(x) = e^{\int -x dx} = e^{-\frac{x^2}{2}}$$

$$\frac{d}{dx} [y e^{-\frac{x^2}{2}}] = -x e^{-\frac{x^2}{2}}$$

$$y e^{-\frac{x^2}{2}} = \int -x e^{-\frac{x^2}{2}} dx = e^{-\frac{x^2}{2}} + C$$

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

$$y(1) = 0 \Rightarrow 0 = 1 + C e^{\frac{1}{2}} \Rightarrow C = -e^{-\frac{1}{2}}$$

$$\therefore y = 1 - e^{-\frac{1}{2}} e^{\frac{x^2}{2}} \quad \text{i.e.} \quad y = 1 - e^{\frac{x^2-1}{2}}$$