Name: KEY	ID: KEY	serial:

MATH-260 **Term-082** **QUIZ-1**

1) Find general solution of the following linear first-order differential equation

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$$y' - 2xy = e^{x^2} \quad \text{——— (1)}$$

Here we have $P(x) = -2x$ and $Q(x) = e^{x^2}$

so the integrating factor is

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

Multiplication of both sides of equation (1) by e^{-x^2} yields

$$y' e^{-x^2} - 2x e^{-x^2} = 1$$

which we recognize as

$$\frac{d}{dx}\left[y e^{-x^2}\right] = 1$$ 3

integration then yields

$$y e^{-x^2} = \int 1 \cdot dx \Rightarrow y e^{-x^2} = x + c$$

Multiplication by e^{x^2} gives the general solution

$$\boxed{y(x) = (x+c)e^{x^2}}$$ 2

2) (a) Find general solution of the following separable differential equation

$$y' = x(y-1) \quad \text{-----} \; (*)$$

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(*) is a separable differential equation.

$$\frac{dy}{dx} = x(y-1)$$

$$\frac{dy}{y-1} = x\,dx \quad 2$$

integrate both sides

$$\int \frac{dy}{y-1} = \int x\,dx$$

$$\ln|y-1| = \frac{1}{2}x^2 + C_1 \quad 2$$

$$|y-1| = e^{\frac{1}{2}x^2 + C_1} = e^{C_1} \cdot e^{\frac{1}{2}x^2}$$

$$y - 1 = \left(\pm e^{C_1}\right) e^{\frac{1}{2}x^2}$$

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

$$(**) \quad \boxed{y(x) = 1 + C e^{\frac{1}{2}x^2}}$$ is the general solution.

Note that: $y(x) = 1$ is a solution for (*) and also a member of the family (**)

2) (b) The differential equation (*) has a singular solution (TRUE or FALSE)

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