NAME: *Key*   SECTION:

Quiz 2: No calculators. Justify all answers. No partial credit is given for an unexplained and incorrect answer.

Consider the differential equations (a) and (b) below.

$$\text{(a) } y' = \frac{y + e^{t/3}}{2}$$

$$\text{(b) } y' = \frac{t^2}{1 + y^2}$$

1. (2pts) Which of the above equations are separable?

   $$\text{Just (b)}$$

2. (2pts) Which are linear?

   $$\text{Just (a)}$$

3. (3pts) Find the general solution to (a).

   $$\frac{d}{dt}\left(y\, e^{-\frac{1}{2}t}\right) = \frac{1}{2}e^{-t/6}$$

   $$\boxed{y = c\, e^{\frac{1}{2}t} - 3e^{t/3} \quad \text{for } c \in \mathbb{R}}$$

4. (3pts) Find the general solution to (b).

   $$\int (1+y^2)\, dy = \int t^2\, dt$$

   $$\boxed{y + \frac{y^3}{3} = \frac{t^3}{3} + C \quad \text{for } c \in \mathbb{R}}$$

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