

ANSWERS:

1. (a) first order, non-linear; (b) second order, non-linear; (c) second order, linear; (d) third order, linear.

2. C

3. C

4. D

5. A

6. C

7. $y(t) = \frac{-te^{-t} - e^{-t} + 2e^{-1}}{t^4}$.

8. (a) The initial value problem describing the process is: $Q' = 3e^{-t} - \frac{3}{100}Q$, $Q(0) = 100$.

The solution is $Q(t) = \frac{10000}{97}e^{-\frac{3}{100}t} - \frac{300}{97}e^{-t}$.

(b) The limiting concentration is $\lim_{t \rightarrow \infty} \frac{Q(t)}{100} = \frac{1}{100} \lim_{t \rightarrow \infty} Q(t) = 0$.

9. (a) $\frac{\partial(4xy - 3)}{\partial x} = 4y = \frac{\partial(2y^2 + 2x)}{\partial y} \Rightarrow$ it's an exact equation.

(b) $2xy^2 - 3y + x^2 = C$.

10. (a) $y(t) = \frac{-1}{2}e^{-t} \sin 2t$.

(b) $y(t) = \frac{t^2}{4} + 2 \ln t - 1 - 4 \ln 2$.

11. $\alpha = -\frac{1}{4}$.

12. (a) $y_2 = t^4$.

(b) $W(t, t^4) = 3t^4 > 0$ through out the interval $(0, \infty)$.