

MathQuest: Differential Equations

Integrating Factors

1. If y is a function of t , which of the following is $t \left(y' + \frac{1}{t}y \right)$ equivalent to?

(a) $[ty]'$

(b) $\left[\frac{1}{t}y \right]'$

(c) ty'

(d) $\frac{1}{t}y'$

(e) None of the above

2. Which of the following is an integrating factor for $y' + 3ty = \sin t$?

(a) $e^{\frac{3}{2}t^2}$

(b) e^3

(c) $e^{\sin t}$

(d) $e^{-\cos t}$

(e) e^{3y}

(f) All of the above

3. Which of the following is an integrating factor for $y' + 2y = 3t$?

(a) e^{2t}

(b) e^{2t+5}

(c) e^2e^{2t}

(d) $7e^{2t}$

(e) All of the above

(f) None of the above

4. Which of the following is an integrating factor for $3y' + 6ty = 8t$?

(a) e^{3t^2}

(b) e^{t^2}

- (c) e^6
 - (d) All of the above
 - (e) None of the above
 - (f) This problem cannot be solved with integrating factors.
5. Can integrating factors be used to solve $y' + 2ty = 1$?
- (a) Yes. The solution is $y = e^{-t^2} \int e^{t^2} dt$.
 - (b) No - we cannot evaluate $\int e^{t^2} dt$.
6. The differential equation $y' + 2y = 3t$ is solved using integrating factors. The solution is $y = \frac{3}{2}t - \frac{3}{4} + Ce^{-2t}$. Which of the following statements describes the long-term behavior as $t \rightarrow \infty$?
- (a) The solutions will approach zero, because $e^{-2t} \rightarrow 0$ as $t \rightarrow \infty$.
 - (b) The solutions will grow without bound because $\frac{3}{2}t \rightarrow \infty$ as $t \rightarrow \infty$.
 - (c) The long-term behavior depends on the initial condition; we need to know the value of C before we can answer this.
7. Which of the following is $e^{3t}(y' + 2y)$ equivalent to?
- (a) $[e^{2t}y]'$
 - (b) $[e^{3t}y]'$
 - (c) $e^{3t}y'$
 - (d) $e^{2t}y'$
 - (e) None of the above