

Ordinary Differential Equations

Name _____

When finished submit your answers by following the appropriate link on **my Assignments** page.
If you feel the answer is none of the choices given, submit no answer to the question.

1. For the first order linear differential equation $xy' + 4y = x^2$, what is the integrating factor?

A. e^{4x}

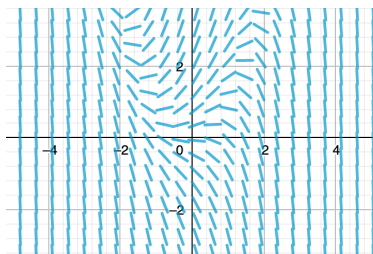
B. x^4

C. $4\ln x$

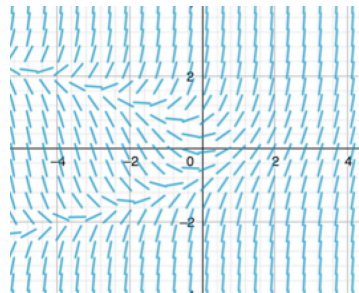
D. $e^{\frac{4}{x}}$

2. Which of the following is the slope field for the differential equation $\frac{dy}{dt} = y^2 + t$?

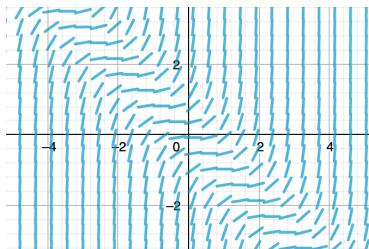
A.



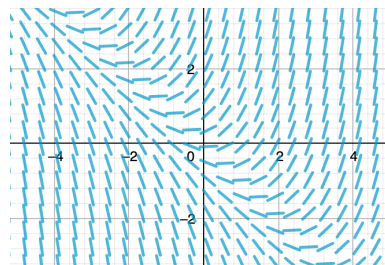
C.



B.



D.



3. Consider the autonomous differential $y' = 4 - y^2$. Find **and** classify the equilibrium solutions.

4. Given the initial value problem $ty' + y - t^2 = 0$; $y(1) = 1$, what is $y(2)$?

A. $\frac{5}{4}$

B. $-\frac{5}{3}$

C. $\frac{5}{3}$

D. $-22 + 15e^{-1}$

5. Which of the following is a solution to problem $y'' + 4y = 0$?

A. $x \sin x$

B. e^{-2x}

C. $\sin 2x$

D. $3\cos 2x$

6. Is $\frac{dy}{dx} = \frac{x}{x+y}$ exact?

A. Yes

B. No

7. $\frac{dy}{dx} = \frac{x - y \cos x}{\sin x + y}$ is an exact differential equation. Express the solution as an implicit function of y .

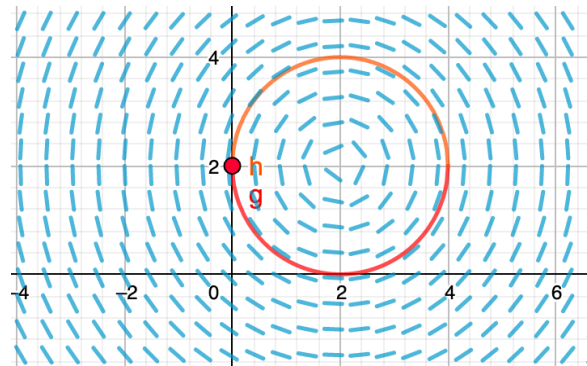
8. Which of the following functions represent the solution to $\frac{dy}{dx} = \frac{x - 2}{2 - y}$?

A. $2y - \frac{1}{2}y^2 = \frac{1}{2}x^2 - 2x + 2$

B. $2y - \frac{1}{2}y^2 = \frac{1}{2}x^2 - 2x$

C. $y^2 = x^2 - 2x + 2$

D. $2y = \frac{1}{2}x^2 - 2x + 4$



9. A 4 ohm resistor and an inductor of 1 henry are connected in series with a voltage given by $100e^{-4t} \cos 50t$, $t \geq 0$. Find $I(t)$ if $I(0) = 0$.

10. The differential equation $\frac{dy}{dx} = \frac{3x}{x^2 - x - 6}$ is directly integrable via partial fraction decomposition.

What values of A and B would be appear in the decomposition $\frac{A}{x - 3} + \frac{B}{x + 2}$?

- Initially, a large tank with a capacity of 100 gallons contains 50 gallons of pure water. A salt solution with a concentration of 0.1 lb/gal flows into the tank at a rate of 4 gal/min. The mixture is kept well-stirred and flows out of the tank at the rate of 2 gal/min.

11. How long before the tank overflows?

12. Find the amount of salt in the tank when the tank overflows.