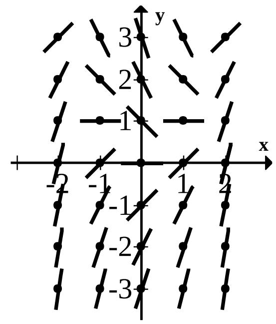
**1.** Which of the following differential equations matches the slope field at right?




(a) $\frac{dy}{dx} = x + y^2$ (b) $\frac{dy}{dx} = x - y^2$ (c) $\frac{dy}{dx} = xy$

(d) $\frac{dy}{dx} = x + y$ (e) $\frac{dy}{dx} = x^2 - y$

**2.** **<u>(Calculator Required):</u>** A cup of coffee is heated to boiling (212°F), and taken out of a microwave and placed in a 72°F room at time $t = 0$ minutes. The coffee cools at the rate of $16e^{-0.112t}$ degrees Fahrenheit per minute. To the nearest degree, what is the temperature of the coffee at time $t = 5$ minutes?

(a) 105°F (b) 133°F (c) 166°F (d) 151°F (e) 203°F

**3.** The table below gives values of the differentiable functions $f$ and $g$ at $x = -1$. If $h(x) = \frac{f(x) - g(x)}{2f(x)}$, then $h'(-1) =$

| $x$ | $f(x)$ | $g(x)$ | $f'(x)$ | $g'(x)$ |
|---|---|---|---|---|
| $-1$ | $-2$ | 4 | $e$ | $-3$ |

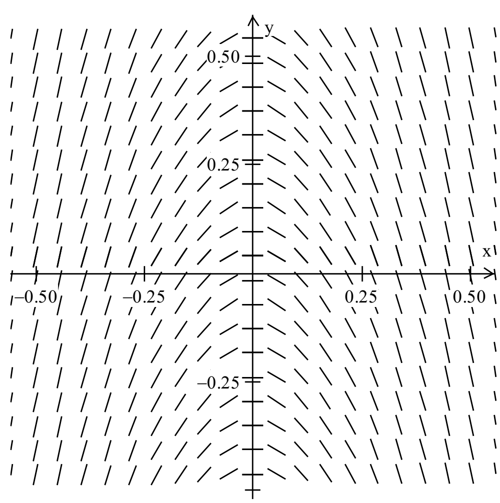
(a) $\frac{-e-3}{4}$ (b) $\frac{e+3}{2e}$ (c) $\frac{e-6}{8}$ (d) $\frac{2e-3}{4}$ (e) $\frac{-4e-3}{4}$

**4.** If $f(x)$ is an antiderivative of $\frac{\sin^2 x}{x^2+2}$ such that $f(2) = \frac{1}{2}$, then $f(0)$ is given by

(a) $\int_0^2 \frac{\sin^2(x)}{x^2+2}\,dx$ (b) $\int_2^0 \frac{\sin^2(x)}{x^2+2}\,dx$ (c) $\frac{1}{2} + \int_2^0 \frac{\sin^2(x)}{x^2+2}\,dx$

(d) $\frac{1}{2} + \int_0^2 \frac{\sin^2(x)}{x^2+2}\,dx$ (e) $2 + \int_2^0 \frac{\sin^2(x)}{x^2+2}\,dx$

**5.** Shown at right is the slope field of a differential equation. Which of the following could be a solution to the differential equation?




(a) $y = e^x$

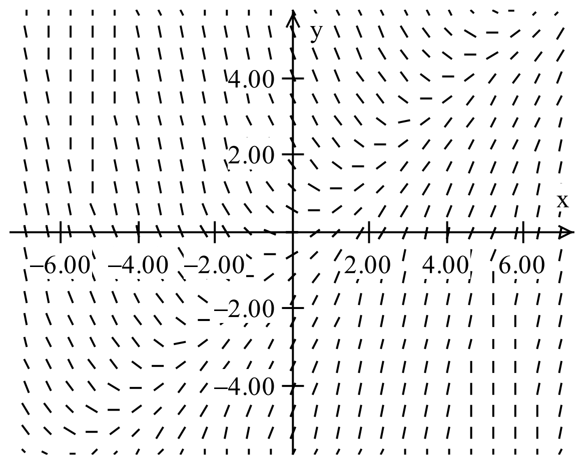
(b) $y = x^3$

(c) $y = -5x^2$

(d) $y = x$

(e) $y = x^2$

**6.** Which of the following differential equations is represented by the slope field at right?




(a) $\frac{dy}{dx} = 1 + y^2$

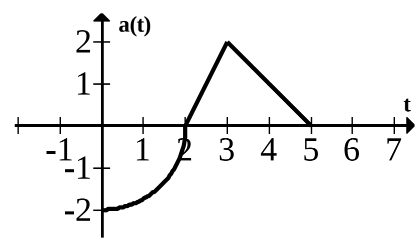
(b) $\frac{dy}{dx} = x - y$

(c) $\frac{dy}{dx} = 2x^2$

(d) $\frac{dy}{dx} = 1 + x^2$

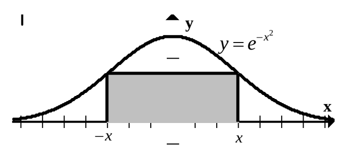
(e) $\frac{dy}{dx} = 1 - y^2 + x^2$

**7.** The graph at right shows an object's acceleration in $\frac{\text{ft}}{\text{sec}^2}$. It consists of a quarter circle, and two line segments. If the object was at rest at $t = 5$ seconds, what was its initial velocity?




(a) $-2\frac{\text{ft}}{\text{sec}}$ (b) $3 - \pi\frac{\text{ft}}{\text{sec}}$ (c) $0\frac{\text{ft}}{\text{sec}}$ (d) $\pi - 3\frac{\text{ft}}{\text{sec}}$ (e) $\pi + 3\frac{\text{ft}}{\text{sec}}$

**8.** The area of the largest rectangle that can be drawn with one side along the *x*-axis and two vertices on the curve $y = e^{-x^2}$ is




(a) $\sqrt{\frac{2}{e}}$ (b) $\sqrt{2e}$ (c) $\frac{2}{e}$ (d) $\frac{1}{\sqrt{2e}}$ (e) $\frac{2}{e^2}$

**9.** What is $y$ if $\frac{dy}{dx} = \frac{3x+2}{5y}$ and $y = 1$ when $x = 2$?

(a) $y = \sqrt{\frac{3x^2 + 4x - 15}{5}}$ (b) $y = \pm\sqrt{\frac{3x^2 + 4x - 15}{5}}$ (c) $y = \sqrt{\frac{3x^2 + 4x + 13}{5}}$

(d) $y = \pm\sqrt{\frac{3x^2 + 4x}{5}}$ (e) $y = \sqrt{\frac{3x^2 + 4x}{5}}$

**10.** Let $\frac{dy}{dx} = e^{x-y}$. Which of the following is the solution to this differential equation with the condition that $y(0) = 1$?

(a) $y = \ln(x)$ (b) $y = \ln(e^x + e)$ (c) $y = x$ (d) $y = e^x$ (e) $y = \ln(e^x + e - 1)$