

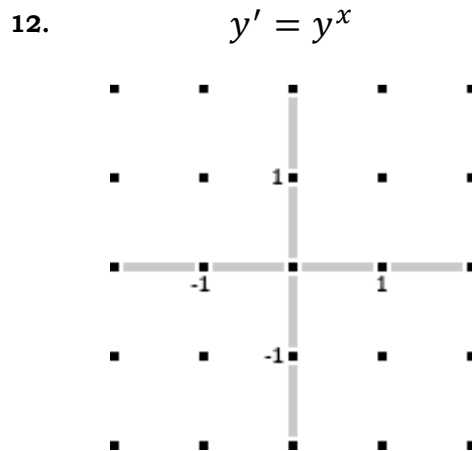
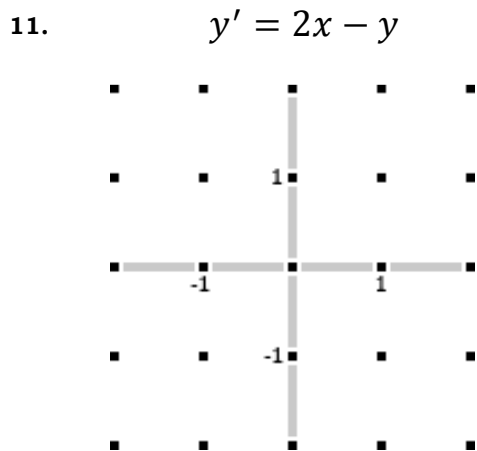
# Calculus Test

Your Name:

(1-10) (T) rue or (F)alse?

- |  |   |
|--|---|
| <p>1. <math>e^{8+2x} = e^8(e^x)^2</math> <input style="width: 40px; height: 30px; border: 1px solid black;" type="checkbox"/></p>  | <p>2. <math>5^{3y} = e^{(\ln 125)y}</math> <input style="width: 40px; height: 30px; border: 1px solid black;" type="checkbox"/></p>   |
| <p>3. <math>\log(a - b) = \frac{\log a}{\log b}</math> <input style="width: 40px; height: 30px; border: 1px solid black;" type="checkbox"/></p>  | <p>4. <math>2 + 3 \ln y = \ln e^2 y^3</math> <input style="width: 40px; height: 30px; border: 1px solid black;" type="checkbox"/></p> |
| <p>5. <math>\log \sqrt{4x} = \log 2 + \log x</math> <input style="width: 40px; height: 30px; border: 1px solid black;" type="checkbox"/></p>   | <p><input style="width: 40px; height: 30px; border: 1px solid black;" type="checkbox"/></p>   |
| <p>6. <math>\ln(Ae^{kt} + C) = kt + \ln A + \ln C</math> <input style="width: 40px; height: 30px; border: 1px solid black;" type="checkbox"/></p>  | <p><input style="width: 40px; height: 30px; border: 1px solid black;" type="checkbox"/></p>   |
| <p>7. <math>f(x) = \begin{cases} x - 1 &amp; , x &lt; 1 \\ 1 - \sqrt{x} &amp; , x &gt; 1 \end{cases}</math> The function is continuous on the interval <math>[0, 2]</math>.</p>                      | <p><input style="width: 40px; height: 30px; border: 1px solid black;" type="checkbox"/></p>   |
| <p>8. <math>g(x) = \begin{cases} x^3 &amp; , x \leq -1 \\ -e^{x+1} &amp; , x &gt; -1 \end{cases}</math> The function is continuous on the interval <math>[-2, 0]</math>.</p>                         | <p><input style="width: 40px; height: 30px; border: 1px solid black;" type="checkbox"/></p>   |
| <p>9. <math>h(x) = \frac{\tan x}{\pi - x}</math> The function is continuous on the interval <math>(\pi/2, \pi)</math>.</p>   | <p><input style="width: 40px; height: 30px; border: 1px solid black;" type="checkbox"/></p>   |
| <p>10. If a function <math>f</math> is continuous at <math>x = a</math> but not differentiable at <math>x = a</math>, then <math>f'</math> must have a vertical asymptote at <math>x = a</math>.</p> | <p><input style="width: 40px; height: 30px; border: 1px solid black;" type="checkbox"/></p>   |

(11-12) Sketch the field for the given differential equation, drawing a hash mark for each point on the graph.



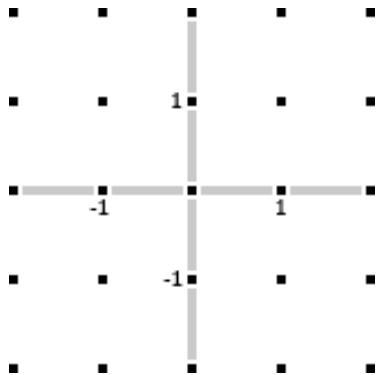
(13-18) Show all work.

13. 
$$y' = \frac{2x}{y^2}$$

For the given differential equation:

- Sketch its direction field.
- Sketch the solution that goes through the point  $(-2, 2)$ .
- For the solution that goes through the point  $(-2, 2)$  use Euler's Method to approximate the value of  $y$  when  $x = 0$ . Use a step size of 0.5.
- Solve the differential equation.
- Give the equation for the solution that goes through the point  $(-2, 2)$ .

a. and b.



c.

d.

e.

14. Solve the differential equation.

$$y' = x \sec y$$

15. Solve the initial-value problem.

$$(x^2 + 1)y' = 2xy$$

$$y(0) = e$$

16. A population of smurfs is growing at a rate equal to twice its size.

- a. Give the differential equation that describes this growth.

- b. Give a formula for the population  $P$  at time  $t$ .

17. At the Kool-Aid factory, there resides a massive mixing tank that holds 6500 liters of Kool-Aid solution. To make Kool-Aid, the workers mix Kool-Aid crystals into initially pure water. A solution containing 0.25 kg per liter is added to the tank at a rate of 16 liters per minute. Liquid flows out of the bottom of the tank at the same rate of 16 L/min.

- a. Write a function for the amount of crystals in the tank at time  $t$ .

- b. At what time will the amount of crystals in the tank reach 1000 kg?