

SATPREP

Find the derivative of each function. Simplify all results to reasonably nice functions, unless otherwise stated.

1. $f(x) = x^{17} + \frac{5}{3}x^3 - 7x + \pi^2 - \sqrt{x} + x^{-3}$
2. $y = \frac{4}{\sqrt[3]{x}} + \frac{2}{x^3}$
3. $y = \frac{(x+1)(3x-5)}{5x^4}$
4. $f(x) = 3 \tan x - 5 \sec x + \frac{\cos x}{10} - 2 \arcsin x$
5. $g(x) = \frac{e^x + \ln x}{x^2 + 1}$
6. $h(x) = \frac{x^2 \sin x + x \cos^2 x}{x \cos x}$
7. $y = (3x - 1)^4 + e^{5x} - \ln(x^2 + 1) - \arctan(4x + 3)$
8. $f(t) = \sin^5(e^{t^2} - \cos t)$
9. $y = \arccos\left(\frac{x}{x+1}\right) + e^{-x} \csc x$
10. $f(x) = \log_5(5^x) + \log_3(\sqrt{x}) - 7^{\sec x}$

For each curve, find $\frac{dy}{dx}$.

11. $x^2 + 2xy - 3y^2 = 5$
12. $\ln\left(\frac{x}{y}\right) = -10x$

In each case, find the equation of all tangent lines to the given curve at the given x -value.

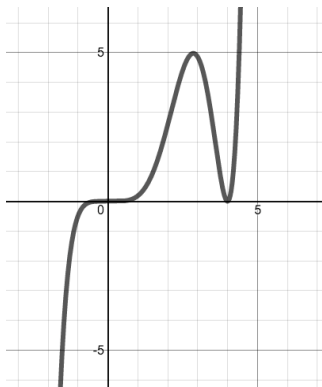
13. $y = (2x + 1)^3$ at $x = 1$
14. $x^2y - y^2x = 2$ at $x = -1$

Find the x -values at which the curve has a horizontal tangent line.

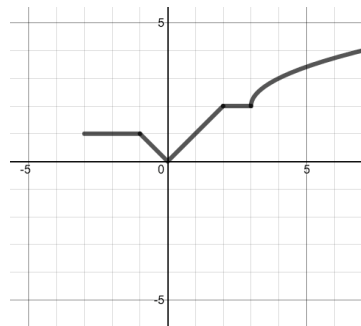
15. $y = \arctan(e^{2x} - x)$
16. $y = \frac{3\sqrt[3]{x}}{x^2 + 4}$

For each function, sketch a possible graph of the derivative.

17.



18.



Derivatives Worksheet Answers

Calculus I

1. $f'(x) = 17x^{16} + 5x^2 - 7 - \frac{1}{2\sqrt{x}} - \frac{3}{x^4}$

2. $y' = \frac{-4}{3\sqrt[3]{x^4}} - \frac{6}{x^4}$

3. $y' = -\frac{6}{5x^3} + \frac{6}{5x^4} + \frac{4}{x^5}$

4. $f'(x) = 3 \sec^2 x - 5 \sec x \tan x - \frac{1}{10} \sin x - \frac{2}{\sqrt{1-x^2}}$

5. $g'(x) = \frac{(e^x + \frac{1}{x})(x^2 + 1) - 2x(e^x + \ln x)}{(x^2 + 1)^2}$ (do not simplify answer)

6. $h'(x) = \tan x + x \sec^2 x - \sin x$

7. $y' = 12(3x - 1)^3 + 5e^{5x} - \frac{2x}{x^2 + 1} - \frac{4}{1 + (4x + 3)^2}$

8. $f'(t) = 5(2te^{t^2} + \sin t) \sin^4(e^{t^2} - \cos t) \cos(e^{t^2} - \cos t)$

9. $y' = \frac{-1}{(x+1)^2 \sqrt{1 - (\frac{x}{x+1})^2}} - e^{-x} \csc x - e^{-x} \csc x \cot x$ (could be simplified more, if you're brave!)

10. $f'(x) = 1 + \frac{1}{(2 \ln 3)x} - 7^{\sec x} (\ln 7) \sec x \tan x$

11. $\frac{dy}{dx} = \frac{2x+2y}{6y-2x}$

12. $\frac{dy}{dx} = \frac{10xy+y}{x}$

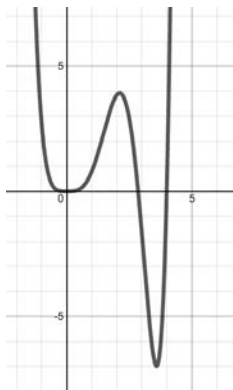
13. $y = 54x - 27$

14. $y = -2, y = x + 2$

15. $x = \ln \sqrt{1/2}$

16. $x = \pm \sqrt{4/5}$

17.



18.

