

1	Use the limit definition of the derivative to find $f'(x)$ for $f(x) = 2x^2 + 1$
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Find the derivative of each function below.

2	$y = \frac{2-x}{3x+1}$
3	$y = \frac{2}{(5x+1)^3}$
4	$f(x) = \frac{x}{\sqrt{1-x^2}}$
5	$f(x) = (x^2 - 2)(x^{-1} + 2)$
6	$y = 3x^2 + \frac{2}{x} - \frac{5}{x^2}$

Answer each question about tangents and normals.

7	Find the points on the curve $y = 2x^3 - 3x^2 - 12x + 20$ where the tangent line is parallel to the $x$ -axis.
8	Find the slope of the normal to $f(x) = 2x^3 + x^2 - 1$ at the point where $x = \frac{1}{2}$
9	Find the equation of the tangent to $y = \sqrt{x^3 + 1}$ at the point where $x = 2$ .
10	Find $\frac{dy}{dx}$ for $y = (x^2 + 1)(x^3 + 1)$ , then find the slope of the normal when $x = -1$ .
11	If the line $2x - y = 3$ is tangent to the function $f(x) = x^2 + 2x - 3$ , what is the point of tangency?
12	If the slope of a tangent line is 5 then what is slope of the normal line to the same curve at the same point?
13	At what $x$ -value is $y = 3x - 1$ tangent to $f(x) = x^3 + 1$ .

For #14-18, use the table below to find the indicated value

$x$	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	5	-1	1	2
2	4	-1	3	$\frac{3}{2}$
3	3	-1	4	1
4	2	-1	5	1
5	1	0	6	$-\frac{1}{2}$
6	2	1	4	-2

14. Given  $h(x) = f(x) + g(x)$ , find  $h'(2)$ .

15. Given  $d(x) = f(x) - g(x)$ , find  $d'(3)$ .

16. Given  $p(x) = f(x) \cdot g(x)$ , find  $p'(4)$ .

17. Given  $q(x) = \frac{f(x)}{g(x)}$ , find  $q'(2)$ .

18. Given  $k(x) = (f(x))^2$ , find  $k(2)$ .

Answers:

1) $f'(x) = 4x$	2) $\frac{dy}{dx} = \frac{-7}{(3x+1)^2}$	3) $y' = \frac{-30}{(5x+1)^4}$	4) $f'(x) = \frac{1}{\sqrt{(1-x^2)^3}}$
5) $f'(x) = 4x + 2x^{-2} + 1$	6) $y' = 6x - \frac{2}{x^2} + \frac{10}{x^3}$	7) $(-1, 27)$ $(2, 0)$	8) $-\frac{2}{5}$
9) $y - 3 = -\frac{1}{2}(x - 2)$	10) $\frac{dy}{dx} = 5x^4 + 3x^2 + 2x$ $-\frac{1}{6}$	11) $(0, -3)$	13) $x \pm 1$