

Find each derivative.

1) $y = \frac{x^2-3}{\sqrt{x}}$

2) $y = \frac{\sin x}{x^2}$

3) $y = x^3 e^{3x}$

4) $y = \sin^5(e^{2x})$

Use the table to find $h'(3)$ for each.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
3	5	-3	2	4
6	1	2	-4	5

5) $h(x) = f(2x)$

6) $h(x) = f(x)g(2x)$

7) $h(x) = \frac{f(x)}{x^2}$

8) $h(x) = \frac{g(x)}{f(x)}$

The table below shows values of f and f' . The function is twice differentiable on the interval $[0, 14]$.

x	0	2	5	9	10	11	14
$f(x)$	6	5	4	-2	3	7	9
$f'(x)$	2	-1	3	0	-5	1	2

9) Is there an x value where $f(x) = 3$ in the interval $5 \leq x \leq 9$? Justify your answer.10) Is there an x value where $f'(x) = 5$ in the interval $9 \leq x \leq 10$? Justify your answer.

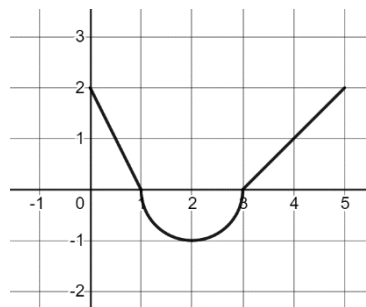
11) Write the equation of the line tangent to f at $x = 2$. Use the equation of the tangent line to approximate $f(1.9)$.

12) Evaluate: $\lim_{x \rightarrow 3} \frac{f(3x) + x - 1}{f(x-3) - 2x}$

Find each of the following: Increasing and decreasing intervals, local extrema, concave up and concave down intervals, and points of inflections on the graph of $f(x)$. Justify your answers.

13) $f(x) = xe^{3x}$

14) Below is the graph of $f'(x)$



Find the values of a and b that makes the function differentiable.

15) $f(x) = \begin{cases} ax^2 - 3, & x \leq 2 \\ 2x - b, & x < 2 \end{cases}$

[Calculator Active] Use a graphing calculator to answer the following question.

16) The derivative of $h(x)$ is given by $h'(x) = 2 \cos\left(x - \frac{\pi}{6}\right) + 1$ on the interval $[-2\pi, 2\pi]$.

Where is $h(x)$ increasing?

Where is $h(x)$ decreasing?

Where is $h(x)$ concave up?

Where is $h(x)$ concave down?

Where does $h(x)$ have a local maximum?

Where does $h(x)$ have a local minimum?

Where does $h(x)$ have a point of inflection?

17) [Calculator Active] A particle moves along the x-axis with the velocity of $v(t) = 100\sqrt{\frac{1}{1+t^2}} - t$, where $v(t)$ is measured in meters per second on the interval $[0, 30]$.

Find each of the following. Using correct units, describe each in the context of the problem.

$v(25)$

$v'(25)$

When is the particle moving left?

When is the acceleration negative?