

2.1 Derivative Basics: Form A Assessment

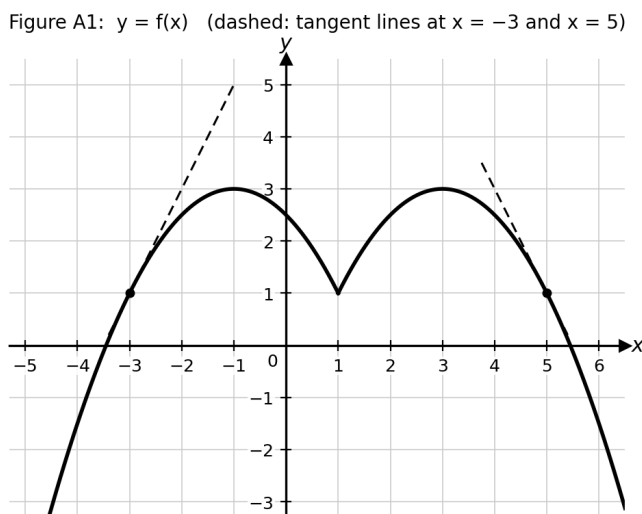
Name: _____

Time: 60 minutes No calculator 100 points

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Answer exactly the question asked. Show work on every problem in Parts II–IV.
If a derivative does not exist, write DNE. If a function value does not exist, write *undefined*.
Angles are in radians.

Part I. Graph. Questions 1(a)–1(f) refer to Figure A1. The dashed lines are tangent to the graph of f at $x = -3$ and $x = 5$.



1. Use the figure to answer each part.

(a) $f(-3)$ _____

(b) $f'(5)$ _____

(c) $f'(-1)$ _____

(d) $f'(1)$ _____

(e) Every open interval within $(-5, 6)$ on which $f'(x) < 0$: _____

(f) Write $f'(-3)$, $f'(5)$, and 0 in order from least to greatest: _____

(2 pts each for (a)–(d), 3 pts each for (e)–(f); 14 pts)

Part II. Tangent lines and values. Show work.

2. Let $f(x) = x^3 - 4x + 1$. The slope of the graph of f at $x = 2$ is $f'(2) = 8$. Find an equation of the line tangent to the graph of f at $x = 2$. (5 pts)

3. Let $r(x) = x^3 - 2x^2 + 3$. Find an equation of the line tangent to the graph of r at $x = -1$. **(5 pts)**

4. The line tangent to the graph of a function w at $x = 2$ has equation

$$y - 7 = 3(x - 2) + 2x - 1.$$

(a) Find $w'(2)$.

(b) Find $w(2)$.

(3 + 2 pts)

5. Let $p(x) = 2x^3 - 5x^2 + x$, so that $p'(x) = 6x^2 - 10x + 1$. Find $p(2)$.

(2 pts)

Part III. Definition of the derivative. Show work.

6. Let $f(x) = \frac{3}{x-2}$. Use the definition

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

to find $f'(x)$. An answer found with differentiation rules instead of the definition earns at most 2 points. **(8 pts)**

7. Let $g(x) = x^3 + x$. Use the definition

$$g'(c) = \lim_{x \rightarrow c} \frac{g(x) - g(c)}{x - c}$$

with $c = 2$ to find $g'(2)$. An answer found with differentiation rules instead of the definition earns at most 2 points. **(8 pts)**

8. Evaluate each limit. **(6 each, 12 pts)**

(a) $\lim_{h \rightarrow 0} \frac{\frac{1}{2+h} - \frac{1}{2}}{2h}$

(b) $\lim_{x \rightarrow \pi} \frac{\sin x}{x - \pi}$

Part IV. Differentiation rules. Show work.

9. Find each derivative. **(3 each, 6 pts)**

(a) $a(x) = \sin\left(\frac{\pi}{4}\right)$. Find $a'(x)$.

(b) Let $f(x) = x^4 - 3x$, and let $m(x) = f(2)$ for every x . Find $m'(x)$.

10. Find $f'(x)$ for each function. **(3 each, 12 pts)**

(a) $f(x) = \frac{6}{\sqrt{x}} - 4 \cos x$

(b) $f(x) = \frac{2x^4 - 5x}{x}$

(c) $f(x) = 5\sqrt[3]{x^2} - \frac{2}{x^3}$

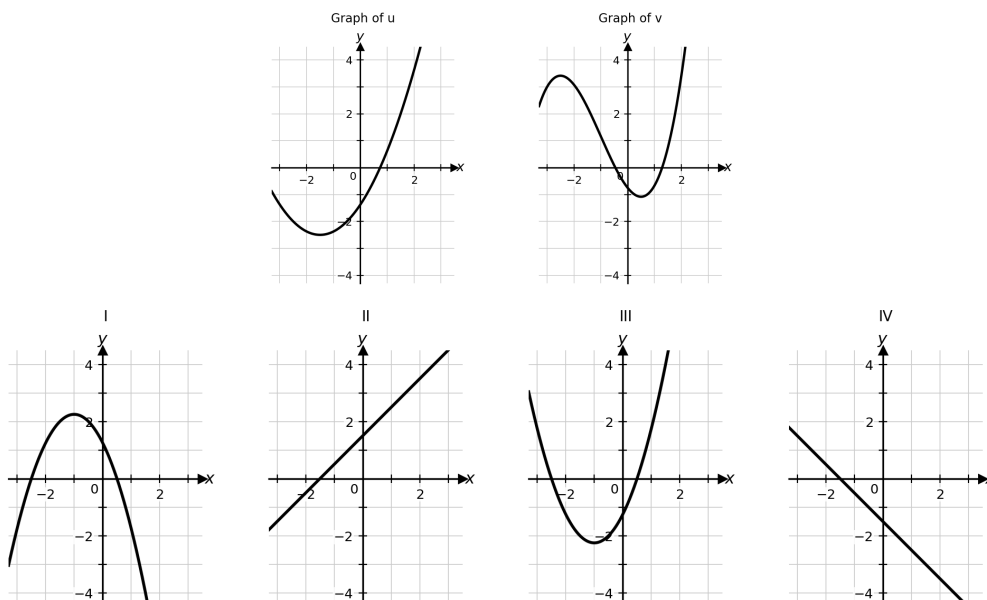
(d) $f(x) = (2x - 3)^2 - 3 \sin x$

11. Let $f(x) = x^2 - 3 \sin x$. Find $f'(\pi)$. **(5 pts)**

12. Let $f(x) = x + 2 \cos x$. Find every x in the interval $(\frac{\pi}{2}, 2\pi]$ at which the graph of f has a horizontal tangent line. (6 pts)

Part V. Graphs of derivatives.

13. The graphs of u and v are shown, followed by four graphs labeled I–IV. (3 each, 6 pts)



- (a) The graph of u' is graph _____ (b) The graph of v' is graph _____

14. Figure A4 shows the graph of k , which is made of straight line segments and continues in the same way beyond the window. On the grid at the right, sketch the graph of k' . Use open circles where k' does not exist. (6 pts)

