

CHAPTER TWO

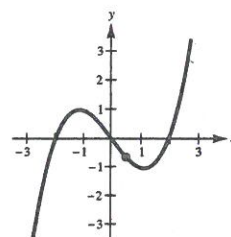
Differentiation

2.1 The Derivative and the Tangent Line Problem

1. Determine which of the following best describes the slope at the indicated point.

- (a) Zero
- (b) No slope
- (c) Positive
- (d) Negative
- (e) None of these

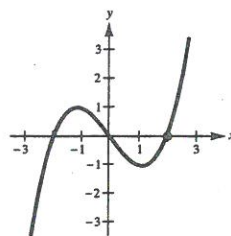
1—M—Answer:



2. Determine which of the following best describes the slope at the indicated point.

- (a) No slope
- (b) Positive
- (c) Negative
- (d) Zero
- (e) None of these

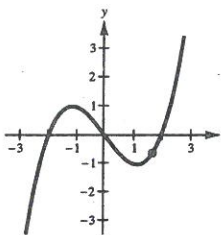
1—M—Answer:



3. Determine which of the following best describes the slope at the indicated point.

- (a) Positive
- (b) Zero
- (c) Negative
- (d) No slope
- (e) None of these

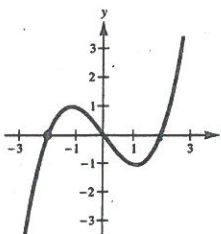
1—M—Answer:



4. Determine which of the following best describes the slope at the indicated point.

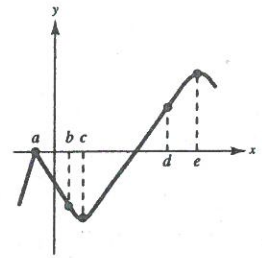
- (a) Negative
- (b) Positive
- (c) No slope
- (d) Zero
- (e) None of these

1—M—Answer:



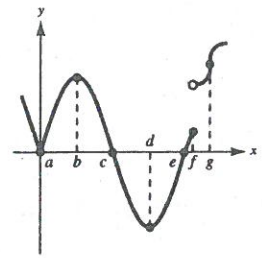
5. At each point indicated on the graph, determine whether the value of the derivative is positive, negative, zero, or if the function has no derivative.

- 1—O—Answer: a. No derivative
 b. Negative
 c. Zero
 d. Positive
 e. Zero



6. Use the graph to determine all x -values at which the function is not differentiable.

- (a) $a, b, c, d, e, f,$ and g
 (b) b and d
 (c) a and f
 (d) $a, f,$ and g
 (e) None of these



1—M—Answer:

7. If $f(x) = 2x^2 + 4$, which of the following will calculate the derivative of $f(x)$?

- (a) $\frac{[2(x + \Delta x)^2 + 4] - (2x^2 + 4)}{\Delta x}$
 (b) $\lim_{\Delta x \rightarrow 0} \frac{(2x^2 + 4 + \Delta x) - (2x^2 + 4)}{\Delta x}$
 (c) $\lim_{\Delta x \rightarrow 0} \frac{[2(x + \Delta x)^2 + 4] - (2x^2 + 4)}{\Delta x}$
 (d) $\frac{(2x^2 + 4 + \Delta x) - (2x^2 + 4)}{\Delta x}$
 (e) None of these

1—M—Answer:

8. If $f(x) = -x^2 + x$, which of the following will calculate the derivative of $f(x)$?

- (a) $\lim_{\Delta x \rightarrow 0} \frac{(-x^2 + x + \Delta x) - (-x^2 + x)}{\Delta x}$
 (b) $\lim_{\Delta x \rightarrow 0} \left[\frac{-(x + \Delta x)^2 + (x + \Delta x)] - (-x^2 + x)}{\Delta x} \right]$
 (c) $\frac{[-(x + \Delta x)^2 + (x + \Delta x)] - (-x^2 + x)}{\Delta x}$
 (d) $\frac{(-x^2 + x + \Delta x) - (-x^2 + x)}{\Delta x}$
 (e) None of these

1—M—Answer:

9. Use the definition of a derivative to calculate the derivative of $f(x) = \frac{1}{x}$.

2—O—Answer: $-\frac{1}{x^2}$

10. Use the definition of a derivative to calculate the derivative of $f(x) = x^2 + x$.

2—O—Answer: $2x + 1$

11. Use the definition of a derivative to calculate the derivative of $f(x) = x^2 + 2$.

2—O—Answer: $-2x$

12. Use the definition of a derivative to calculate the derivative of $f(x) = 2\sqrt{x}$.

2—O—Answer: $\frac{1}{\sqrt{x}}$

13. Find the derivative of $y = 2$.

(a) 0 (b) 1 (c) 2 (d) $2 + \Delta x$ (e) None of these

1—M—Answer: **a**

14. Find the derivative of $y = \pi$.

(a) 1 (b) -1 (c) $\pi + \Delta x$ (d) 0 (e) None of these

1—M—Answer: **d**

15. Find the derivative of $y = -4$.

(a) -4 (b) 0 (c) 1 (d) $-4 + \Delta x$ (e) None of these

1—M—Answer: **b**

16. Find the slope of the tangent line to the graph of $f(x) = -2x + 4$ when $x = 2$.

1—O—Answer: -2

17. Find the slope of the tangent line to the graph of $f(x) = 3x - 1$ when $x = -1$.

1—O—Answer: 3

18. Find the slope of the tangent line to the graph of $f(x) = -x + 3$ when $x = 2$.

1—O—Answer: -1

19. Find the slope of the graph of $f(x) = x^2 - 2x$ at the point $(a, f(a))$.

(a) 0 (b) $2a - 2$ (c) $f(a)$

(d) $a^2 - 2a$ (e) None of these

1—M—Answer: **b**

20. If $f(2) = 3$ and $f'(2) = -1$, find an equation of the tangent line when $x = 2$.

- (a) $y - 3 = 2(x + 1)$ (b) $y - 2 = 3(x + 1)$ (c) $y - 3 = -1(x - 2)$
 (d) $y + 1 = 2(x - 2)$ (e) None of these

1—M—Answer: **(c)**

21. If $f(1) = 4$ and $f'(1) = 2$, find an equation of the tangent line when $x = 1$.

- (a) $y - 4 = 2(x - 1)$ (b) $y + 4 = 2(x + 1)$ (c) $y - 1 = 4(x - 2)$
 (d) $y - 2 = 4(x - 1)$ (e) None of these

1—M—Answer: **(a)**

22. Find an equation of the tangent line to the graph of $f(x) = x^2 - 2x - 3$ at the point $(-2, 5)$.

2—O—Answer: $6x + y + 7 = 0$

23. Find an equation of the tangent line to the graph of $f(x) = \frac{1}{x - 1}$ at the point $(2, 1)$.

- (a) $x + y + 3 = 0$ (b) $x - y = 1$ (c) $y - 1 = -\frac{(x - 2)}{(x - 1)^2}$
 (d) $x + y = 6$ (e) None of these

2—M—Answer: **(e)**

24. Consider $f(x) = \sqrt{x}$.

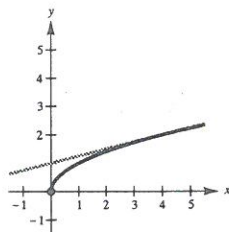
- Use the definition of the derivative to calculate the derivative of f .
- Find the slope of the tangent line to the graph of f at the point $(4, 2)$.
- Write an equation of the tangent line in part b.
- Use a graphing utility to graph f and the tangent line on the same axes. Then sketch the graphs.

2—O—T—Answer: a. $\frac{1}{2\sqrt{x}}$

b. $\frac{1}{4}$

c. $y = \frac{1}{4}x + 1$

d.



25. Let $f(x) = \frac{4}{x}$.

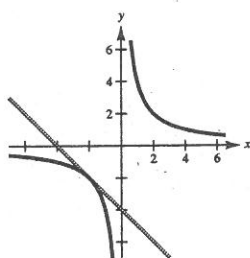
- Use the definition of the derivative to calculate the derivative of f .
- Find the slope of the tangent line to the graph of f at the point $(-2, -2)$.
- Write an equation of the tangent line in part b.
- Use a graphing utility to graph f and the tangent line on the same axes. Then sketch the graphs.

2—O—T—Answer: a. $-\frac{4}{x^2}$

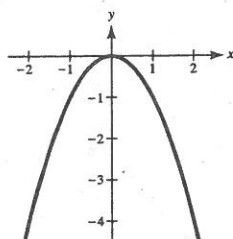
b. -1

c. $y = -x - 4$

d.



26. The graph of f is given. Sketch the graph of f' .



1—O—Answer:

