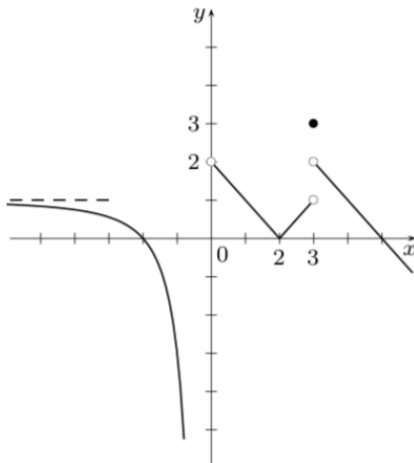


Quarter 1 Review

Limits



Use the graph of $f(x)$ to the left to answer questions #1-12.

- 1) $\lim_{x \rightarrow 3^-} f(x) =$
- 2) $\lim_{x \rightarrow 3^+} f(x) =$
- 3) $\lim_{x \rightarrow 3} f(x) =$
- 4) $f(3) =$
- 5) $\lim_{x \rightarrow 0^-} f(x) =$
- 6) $\lim_{x \rightarrow 0^+} f(x) =$
- 7) $\lim_{x \rightarrow 0} f(x) =$
- 8) $f(0) =$
- 9) $\lim_{x \rightarrow \infty} f(x) =$
- 10) $\lim_{x \rightarrow -\infty} f(x) =$
- 11) Prove that the function $f(x)$ is continuous at $x = 2$.

12) State why the function $f(x)$ is discontinuous at $x = 3$.

13) Find the value of a that would make $f(x) = \begin{cases} x - 3, & x > 2 \\ 2ax + 5, & x \leq 2 \end{cases}$ continuous at $x = 2$.

14) The function $f(x)$ is a continuous function on the interval $[1, 5]$ with the values given below. Is there a value x , when $f(x) = 5$? Explain your answer.

x	1	2	5
$f(x)$	6	2	-3

Evaluate each limit.

15) $\lim_{x \rightarrow -4} \frac{x^2 - 16}{x^2 + 5x + 4}$

16) $\lim_{x \rightarrow 1} \frac{1 - x^2}{x - 1}$

17) $\lim_{x \rightarrow \infty} \frac{(2 - x)(4x + 4)}{(2x + 1)(2 + 3x)}$

18) $\lim_{x \rightarrow 16} \frac{\sqrt{x} - 4}{x - 16}$

19) $\lim_{x \rightarrow \infty} \frac{x^2 + 2x}{e^{x^2}}$

20) $\lim_{h \rightarrow 4} \frac{(2 + h)^2 - 9h}{h - 4}$

Derivative Rules

Find each derivative.

1) $y = \sqrt{x}(x - 3)$

2) $y = \frac{x^2 - 3x + 2}{\sqrt[3]{x}}$

3) $y = x^3 \sin 2x$

4) $y = \left(\frac{5}{x} + x\right)(x - 3)$

5) $y = (4x - 3)^4$

6) $y = \sqrt{\sec x}$

7) $y = \frac{4x - 3}{2x + 1}$

8) $y = \sin^4(2x - 1)$

9) $y = \sin 3x \cos x$

10) Find the average rate of change of $f(x) = x^2 + 1$ on the interval $[-2, 3]$

11) Find the average rate of change of $f(x) = x^2 + 1$ on the interval $[0, 2]$

12) Find the instantaneous rate of change of $f(x) = x^2 + 1$ at $x = 4$.

13) Write the equation of the line tangent to $f(x) = x^2 + 1$ at $x = 4$.

Tabular Derivatives

Suppose that functions f and g and their derivatives have the following values. Evaluate the derivatives of the following combinations at the given value of x .

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
2	8	2	$\frac{1}{3}$	-3
3	3	-4	-2	5

- 1) $2f(x)$ at $x = 2$
- 2) $f(x) + g(x)$ at $x = 3$
- 3) $f(x)g(x)$ at $x = 3$
- 4) $\frac{f(x)}{g(x)}$ at $x = 2$
- 5) $f(g(x))$ at $x = 2$
- 6) $\frac{1}{[g(x)]^2}$ at $x = 3$

Particle Motion

- 1) Suppose $x(t) = \frac{1}{3}t^3 - 4t^2 + 12t + 5$ is a position of a particle moving along the x-axis on the interval $[0,10]$.
 - a. Set up, but don't solve, the average velocity for the first 3 seconds.
 - b. Find the velocity at $t = 4$.
 - c. When is the particle moving to the left? Right?
 - d. When is the velocity increasing?
 - e. When is the velocity decreasing?
 - f. When is the particle speeding up?
 - g. When is the particle slowing down?

- 2) A particle is moving along the x-axis on the interval $[0,10]$.
 - a. Find the average acceleration on the interval $[0,10]$.
 - b. Find the velocity at $t = 2$.
 - c. Find the acceleration at $t = 2$.
 - d. At $t = 2$ is the particle speeding up or slowing down?
 - e. When is the particle moving to the left?
 - f. When is the particle moving to the right?
 - g. When is the acceleration of the particle positive?
 - h. When is the acceleration of the particle negative?
 - i. When is the particle speeding up?
 - j. When is the particle slowing down?

