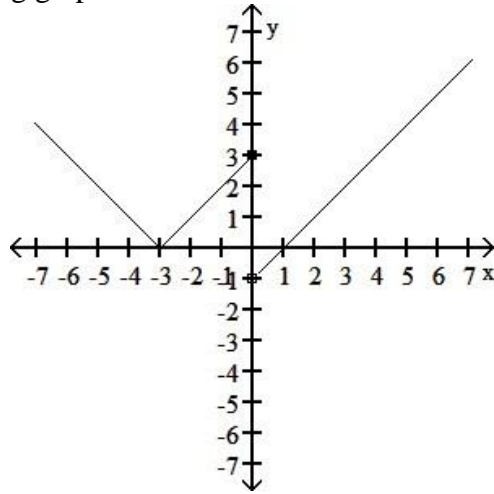


You must show all work to receive credit. If no, or incomplete work is show no credit will be awarded. All irrational numbers must be given in their exact form.

Find the following limits. Use $\pm\infty$ where appropriate.

1. Use the following graph to find the indicated limits



$$\lim_{x \rightarrow 0^+} f(x) = \underline{\hspace{2cm}} \quad \lim_{x \rightarrow 0^-} f(x) = \underline{\hspace{2cm}} \quad \lim_{x \rightarrow 0} f(x) = \underline{\hspace{2cm}}$$

2. $\lim_{x \rightarrow 5} \frac{x-5}{|5-x|}$

3. $\lim_{x \rightarrow -4} \frac{x^2 - 16}{x + 4}$

4. $\lim_{x \rightarrow 2^-} \frac{1}{x-2}$

5. $f(x) = \begin{cases} \frac{x^2 - 16}{x + 4} & \text{if } x > 0 \\ \frac{x^2 - 16}{x - 4} & \text{if } x < 0 \end{cases}$ $\lim_{x \rightarrow 0^+} f(x) = \underline{\hspace{1cm}} \quad \lim_{x \rightarrow 0^-} f(x) = \underline{\hspace{1cm}} \quad \lim_{x \rightarrow 0} f(x) = \underline{\hspace{1cm}}$

6. Let $\lim_{x \rightarrow 5} f(x) = 4$ and $\lim_{x \rightarrow 5} g(x) = -5$, find $\lim_{x \rightarrow 5} \frac{2f(x) + 3g(x)}{3f(x)} =$

7. Sketch a function that satisfies the following conditions:

$$f(1) = 4; \lim_{x \rightarrow 1^-} f(x) = 4; \lim_{x \rightarrow 1^+} f(x) = 3$$

8. $\lim_{x \rightarrow 5^+} \frac{x^2}{(x-5)^3}$

Find the points of discontinuity for the following functions:

$$9. f(x) = \frac{x+3}{2x^2+5x-3}$$

$$10. f(x) = \begin{cases} 3x^2 - 1 & \text{if } x < 2 \\ 11 & \text{if } x = 2 \\ 6x - 1 & \text{if } x > 2 \end{cases}$$

$$11. f(x) = \frac{3x-1}{x^2+5}$$

$$12. \text{ Find all vertical and horizontal asymptotes for the function: } f(x) = \frac{x^2+x-12}{x^2-4}$$

13. Find the average rate of change for the function $f(x) = \sqrt{2x}$ as x changes from 2 to 8.

14. Find the instantaneous rate of change for $f(x) = 5x^2 + x$ at $x = -4$.

Find the derivatives of the following functions, do not leave negative exponents in your answer:

$$15. f(x) = \frac{3x^5 - 7x^2 - 4}{x^2}$$

$$16. f(x) = 9x^{\frac{7}{5}} - 5x^2 + 10000$$

$$17. y = \frac{4}{x^4} - 5\sqrt[3]{x^2}$$

$$18. y = \frac{x^3}{30} - \pi^2$$

19. Let $f(x) = 20 + 15x^2 - x^3$ find both Δy and dy when $x = 2$ and $dx = \Delta x = 0.3$

20. Let the cost and revenue functions be defined as

$$C(x) = 0.0002x^3 - 0.048x^2 + 200x + 50,000 \text{ and } R(x) = 400x. \text{ Find all of the}$$

following:

- Average Cost Function
- Marginal Average Cost Function
- Profit Function
- Marginal Average Profit Function
- Cost for producing the 51st item
- Use marginal analysis to approximate the cost of producing the 51st item