

Evaluate the following limits. You may NOT use a calculator on this assignment.

1. $\lim_{x \rightarrow 8} 7 = 7$

2. $\lim_{x \rightarrow 0} \pi = \pi$

3. $\lim_{x \rightarrow 3} (7x - 4) = 21 - 4 = 17$

4. $\lim_{x \rightarrow -1} (2x^3 - 5x) = 2(-1)^3 - 5(-1) = -2 + 5 = 3$

5. $\lim_{x \rightarrow 3} \sqrt{x^3 - 3x - 1} = \sqrt{5^3 - 3(5) - 1} = \sqrt{125 - 15 - 1} = \sqrt{109}$

6. $\lim_{x \rightarrow -3} \sqrt{5x^2 + 2x} = \sqrt{5(-3)^2 + 2(-3)} = \sqrt{45 - 6} = \sqrt{39}$

7. $\lim_{x \rightarrow 3} \frac{x^2 - 2x}{x + 1} = \frac{9 - 6}{4} = \frac{3}{4}$

8. $\lim_{x \rightarrow 0} \frac{6x - 9}{x^3 - 12x + 3} = \frac{0 - 9}{3} = -3$

9. $\lim_{x \rightarrow 4} \frac{x^2 + 2x - 24}{x - 4} = \frac{(x+6)(x-4)}{(x-4)} = 10$

10. $\lim_{x \rightarrow -2} \frac{x^2 + 7x + 10}{x + 2} = \frac{(x+5)(x+2)}{(x+2)} = 3$

11. $\lim_{x \rightarrow 4} \frac{x^2 - 16}{x - 4} = \frac{(x+4)(x-4)}{(x-4)} = 8$

12. $\lim_{x \rightarrow -1} \frac{x^2 + 7x + 6}{x^2 - 4x - 5} = \frac{(x+6)(x+1)}{(x-5)(x+1)} = \frac{6}{-6} = -1$

13. $\lim_{x \rightarrow 2} \frac{x^2 - 2x}{x^2 - 4} = \frac{x(x-2)}{(x+2)(x-2)} = \frac{2}{4} = \frac{1}{2}$

14. $\lim_{t \rightarrow 3} \frac{9-t}{3-\sqrt{t}} = \frac{3+\sqrt{t}}{3+\sqrt{t}} = 6$

15. $\lim_{y \rightarrow 4} \frac{4-y}{2-\sqrt{y}} = \frac{2+\sqrt{y}}{2+\sqrt{y}} = 4$

16. $\lim_{x \rightarrow \frac{\pi}{2}} \sin(x) = 1$

17. $\lim_{x \rightarrow \pi} \cos(x) = -1$

18. $\lim_{x \rightarrow \frac{3\pi}{2}} \sin(x) = -1$

19. $\lim_{x \rightarrow 2} \cos(x) = 1$

20. $\lim_{x \rightarrow 2} \frac{x^2 - 4x + 4}{(x+3)(x-2)} = 0$

21. $\lim_{x \rightarrow 1} \frac{1-x}{x^2 - 1} = \frac{-(x-1)}{(x+1)(x-1)} = -\frac{1}{2}$

22. $\lim_{x \rightarrow 5} \frac{5-x}{x^2 - 25} = \frac{-(x-5)}{(x+5)(x-5)} = -\frac{1}{10}$

23. $\lim_{x \rightarrow 0} \frac{x}{x} = 1$

24. $\lim_{x \rightarrow 3} \frac{x-3}{x^2 - 6 - 2x} = \frac{x-3}{-2(x+3)} = -\frac{1}{2}$

Piecewise Functions and Limits

$$1) f(x) = \begin{cases} x^2 & \text{if } x \leq 0 \\ x & \text{if } 0 < x < 1 \\ 1-x^2 & \text{if } x \geq 1 \end{cases}$$

$$f\left(\frac{3}{4}\right) = \frac{3}{4}$$

$$f(4) = -15$$

$$f(0) = 0$$

$$\lim_{x \rightarrow 0} f(x) = 0$$

$$\lim_{x \rightarrow -3} f(x) = 9$$

$$\lim_{x \rightarrow 4} f(x) = -15$$

$$\lim_{x \rightarrow 1^-} f(x) = 1$$

$$\lim_{x \rightarrow 1^+} f(x) = 0$$

$$\lim_{x \rightarrow 1} f(x) = \text{dne}$$

$$\lim_{x \rightarrow 2} f(x) = -3$$

$$\lim_{x \rightarrow -1} f(x) = 16$$

$$\lim_{x \rightarrow 0} f(x) = -35$$

$$2) f(x) = \begin{cases} -x^2 + 3 & \text{if } x \leq -2 \\ -2x + 2 & \text{if } -2 < x < 5 \\ (x-4)^2 + 4 & \text{if } x \geq 5 \end{cases}$$

$$f(2) = -2$$

$$f(0) = 2$$

$$f(5) = 5$$

$$\lim_{x \rightarrow -2^-} f(x) = -1$$

$$\lim_{x \rightarrow -2^+} f(x) = 6$$

$$\lim_{x \rightarrow -2} f(x) = \text{dne}$$

$$\lim_{x \rightarrow 0^-} f(x) = 2$$

$$\lim_{x \rightarrow 0^+} f(x) = 2$$

$$\lim_{x \rightarrow 0} f(x) = 2$$

$$\lim_{x \rightarrow 5^-} f(x) = -8$$

$$\lim_{x \rightarrow 5^+} f(x) = 5$$

$$\lim_{x \rightarrow 5} f(x) = \text{dne}$$