University of Calgary
Faculty of Science
Department of Mathematics and Statistics

Math 249

Worksheet 3 (Limits)

A. Find each of the following limits if they exist. If they do not exist, give reasons for your answers.

1. $\lim_{x \to -2} \left(3x^2 - 2x + 7\right)$

2. $\lim_{x \to 2} \left(4x^2 - \frac{2}{x}\right)$

3. $\lim_{x \to 2} \left(\frac{x^2 + x - 6}{x^2 + 3x - 10}\right)$

4. $\lim_{x \to 3} \left(\frac{4x^2 - 7x - 11}{x^2 - 3x - 18}\right)$

5. $\lim_{x \to 1} \left(\frac{\sqrt{3x + 4} - \sqrt{5x + 2}}{\sqrt{2x^2 + 7x} - 3}\right)$

6. $\lim_{x \to 3} \left(\frac{2x^2 + x - 15}{x^2 + 3x - 18}\right)$

7. $\lim_{x \to 2} \left(\frac{4x - 8}{\sqrt{2x + 5} - \sqrt{x^2 + 5}}\right)$

8. $\lim_{x \to 3} \left(\frac{|x - 3|}{x - 3}\right)$

9. $\lim_{x \to 3} \left(\frac{2x^2 - 11x + 15}{x^2 + 3x - 18}\right)$

10. $\lim_{x \to 0} \left(\frac{1}{x\sqrt{1 + x}} - \frac{1}{x}\right)$

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11. $$\lim_{x \to \frac{3}{2}} \left(\frac{2x - 3}{|2x - 3|} \right)$$

12. $$\lim_{x \to 2} \left(\frac{2}{x - 2} \right)$$

13. $$\lim_{x \to 3} \left(\frac{1}{(x - 3)^2} \right)$$

14. $$\lim_{x \to 0^-} \left(\frac{1}{x} - \frac{1}{|x|} \right)$$

15. $$\lim_{x \to 0^+} \left(\frac{1}{x} - \frac{1}{|x|} \right)$$

16. $$\lim_{x \to 1} \left(\frac{x^2 - 1}{|x - 1|} \right)$$

17. $$\lim_{x \to 4} \left(\frac{\sqrt{2x + 1} - 3}{x^2 - 16} \right)$$

18. $$\lim_{x \to 2} \left(\frac{\sqrt{6 - x} - 2}{\sqrt{3 - x} - 1} \right)$$

19. $$\lim_{x \to 4} \left(\frac{\sqrt{2x + 1} - x + 1}{x^2 - 16} \right)$$

20. $$\lim_{x \to 2} \left(\frac{2x - \sqrt{5x + 6}}{x^2 - 4x + 4} \right)$$

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B.

1. Find a so that $\lim_{x \to -2} f(x)$ exists and is finite when $f(x) = \dfrac{3x^2 + ax + a + 3}{x^2 + x - 2}$

2. Given that f is defined as given below, find value(s) of k and a so that $\lim_{x \to -1} f(x)$ exists.

$$f(x) = \begin{cases} \dfrac{1}{2} + a & x \le -1 \\ \dfrac{4kx^2 + (k+4)x + 1}{x^2 - 1} & -1 < x < 1 \\ 2x + 1 & x \ge 1 \end{cases}$$