Math 249 - L02

University of Calgary
Faculty of Science
Department of Mathematics and Statistics
Answers for
Worksheet 3 (Limits)

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

1. $\lim_{x \to -2} (3x^2 - 2x + 7) = 23$

2. $\lim_{x \to 2} \left(4x^2 - \frac{2}{x}\right) = 15$

3. $\lim_{x \to 2} \left(\frac{x^2 + x - 6}{x^2 + 3x - 10}\right) = \frac{5}{7}$

4. $\lim_{x \to 3} \left(\frac{4x^2 - 7x - 11}{x^2 - 3x - 18}\right) = -\frac{2}{9}$

5. $\lim_{x \to 1} \left(\frac{\sqrt{3x + 4} - \sqrt{5x + 2}}{\sqrt{2x^2 + 7x} - 3}\right) = \frac{-6}{11\sqrt{7}}$

6. $\lim_{x \to 3} \left(\frac{2x^2 + x - 15}{x^2 + 3x - 18}\right)$ does not exist

7. $\lim_{x \to 2} \left(\frac{4x - 8}{\sqrt{2x + 5} - \sqrt{x^2 + 5}}\right) = -12$

8. $\lim_{x \to 3} \left(\frac{|x - 3|}{x - 3}\right)$ does not exist

9. $\lim_{x \to 3} \left(\frac{2x^2 - 11x + 15}{x^2 + 3x - 18}\right) = \frac{1}{9}$

10. $\lim_{x \to 0} \left(\frac{1}{x\sqrt{1 + x}} - \frac{1}{x}\right) = -\frac{1}{2}$

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11. $\lim_{x \to \frac{3}{2}} \left(\frac{2x - 3}{|2x - 3|} \right)$ does not exist

12. $\lim_{x \to 2} \left(\frac{2}{x - 2} \right)$ does not exist

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

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

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

16. $\lim_{x \to 1} \left(\frac{x^2 - 1}{|x - 1|} \right)$ does not exist

17. $\lim_{x \to 4} \left(\frac{\sqrt{2x + 1} - 3}{x^2 - 16} \right) = \frac{1}{24}$

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

19. $\lim_{x \to 4} \left(\frac{\sqrt{2x + 1} - x + 1}{x^2 - 16} \right) = -\frac{1}{12}$

20. $\lim_{x \to 2} \left(\frac{2x - \sqrt{5x + 6}}{x^2 - 4x + 4} \right)$ does not exist.

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B.

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

Ans: $a = 15$

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.

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

Ans: $a = 1$; $K = 1$.