CSMATH1

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0.1 Functions and Graphing Practice

Graph each function and give the domain and range.

1. $f(x) = \sqrt{x+3}$
2. $f(x) = 9 - x^2$
3. $f(x) = -4 - x^2$
4. $f(x) = |5x + 2|$
5. $f(x) = \frac{(x^2-4)(x-3)}{x^2-x-6}$
6. $f(x) = \begin{cases} 3 - x & \text{if } x < 2, \\ 3 & \text{if } x = 2, \\ \frac{1}{2}x & \text{if } x > 2. \end{cases}$
7. $f(x) = \begin{cases} 1 - x^2 & \text{if } x < 0, \\ 3x + 1 & \text{if } x \geq 0. \end{cases}$
8. $f(x) = \begin{cases} x + 3 & \text{if } x < -5, \\ 25 - x^2 & \text{if } -5 \leq x \leq 5, \\ 3 - x & \text{if } x > 5. \end{cases}$
9. $f(x) = \begin{cases} 2 & \text{if } x < -2, \\ -1 & \text{if } x = -2, \\ -3 & \text{if } x > -2. \end{cases}$
10. $f(x) = 2 - |x + 4|$

0.2 Limits Practice Exercises

Find the following limits if they exist.

1. $\lim\limits_{x\to 2} x^2 + 2x - 1$
2. $\lim\limits_{t\to 1} \dfrac{t^2 - 5}{2t^3 + 6}$
3. $\lim\limits_{r\to 1} \sqrt{\dfrac{8r + 1}{r + 3}}$
4. $\lim\limits_{x\to -\frac{3}{2}} \dfrac{4x^2 - 9}{2x + 3}$
5. $\lim\limits_{x\to 4} \dfrac{3x^2 - 8x - 16}{2x^2 - 9x + 4}$
6. $\lim\limits_{y\to -2} \dfrac{y^3 + 8}{y + 2}$
7. $\lim\limits_{x\to 1} \dfrac{x^2 + x - 2}{x^2 - x}$

8. $\lim_{u\to 1} \dfrac{u^4-1}{u^3-1}$

9. $\lim_{x\to 2} \dfrac{x^3-2x^2+4x-8}{2x^2-5x+2}$

10. $\lim_{x\to 3} \dfrac{2x^3-5x^2-2x-3}{4x^3-13x^2+4x-3}$

11. $\lim_{h\to 0} \dfrac{\sqrt{2+h}-\sqrt{2}}{h}$

12. $\lim_{x\to 9} \dfrac{\sqrt{x}-3}{x-9}$

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

14. $\lim_{x\to 2^-} \left(\dfrac{4x}{4-x^2}\cdot\dfrac{3}{5x-1}\right)$

15. $\lim_{x\to 2} \dfrac{x^2+4x-12}{x^2-2x}$

16. $\lim_{x\to 1} \dfrac{x-1}{\sqrt{x+3}-2}$

17. $\lim_{x\to -1} \dfrac{\sqrt{x+5}-2}{x+1}$

18. $\lim_{x\to 2^+} \dfrac{x-3}{x^2-4}$

19. $\lim_{x\to -5^-} \dfrac{3x}{2x+10}$

20. $\lim_{x\to 3^-} \dfrac{x^2+x+2}{x^2-2x-3}$

21. $\lim_{x\to 0^+} \dfrac{x^2-3x+2}{x^3-2x^2}$

22. $\lim_{x\to 2^+} \dfrac{x^2-3x+2}{x^3-2x^2}$

23. $\lim_{x\to +\infty} \dfrac{5x^2+8x-3}{3x^2+2}$

24. $\lim_{x\to -\infty} \dfrac{3x+7}{x^2-2}$

25. $\lim_{x\to -\infty} \dfrac{2x^2-3}{7x+4}$

26. $\lim_{x\to -\infty} \dfrac{x}{\sqrt{4+x^2}}$

27. $\lim_{x\to +\infty} \dfrac{3x+4}{\sqrt{2x^2+5}}$

28. $\lim_{x\to 4^-} \left(\dfrac{x-2}{1-8x}+\dfrac{2x-3}{x-4}\right)$

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

30. $\lim_{h \to 0} \frac{2(-3+h)^2 - 18}{h}$

0.3 Trigonometric Limits Practice Exercises

Find the following limits if they exist.

1. $\lim_{x \to 0} \frac{\sin x}{x}$
2. $\lim_{x \to 0} \frac{1 - \cos x}{x}$
3. $\lim_{x \to 0} \frac{\tan x}{x}$
4. $\lim_{x \to 0} \frac{\sin(3x)}{x}$
5. $\lim_{x \to 0} \frac{\sin(5x)}{(2x)}$
6. $\lim_{x \to 0} \frac{1 - \cos x}{x^2}$
7. $\lim_{x \to 0} \frac{\sin^2 x}{x^2}$
8. $\lim_{x \to 0} \frac{\sin(x^2)}{x}$
9. $\lim_{x \to 0} \frac{\tan(3x)}{\sin(5x)}$
10. $\lim_{x \to 0} \frac{1 - \cos(2x)}{x^2}$

0.4 Continuity

On what intervals is each function continuous?

1. $f(x) = x^{100} - 2x^{37} + 75$
2. $g(x) = \frac{x^2 + 2x + 17}{x^2 - 1}$

3. $\sqrt{x} + \dfrac{x+1}{x-1} - \dfrac{x+1}{x^2+1}$

4. Evaluate $\lim\limits_{x \to \pi} \dfrac{sin(x)}{2 + cos(x)}$