HW14.3: 1-29 odd

In Problems 1–12, find the numbers at which f is continuous. At which ...

1. $f(x) = 2x + 3$
2. $f(x) = 4 - 3x$
3. $f(x) = 3x^2 + x$
4. $f(x) =$
5. $f(x) = 4 \sin x$
6. $f(x) = -2 \cos x$
7. $f(x) = 2 \tan x$
8. $f(x) = 4 \csc x$
9. $f(x) = \dfrac{2x + 5}{x^2 - 4}$
10. $f(x) = \dfrac{x^2 - 4}{x^2 - 9}$
11. $f(x) = \dfrac{x - 3}{\ln x}$
12. $f(x) = \dfrac{\ln x}{x - 3}$

In Problems 13–24, find the one-sided limit.

13. $\lim_{x \to 1^-} (2x + 3)$
14. $\lim_{x \to 2^+} (4 - 2x)$
15. $\lim_{x \to 1^+} (2x^3 + 5x)$
16. $\lim_{x \to -2^-} (3x^2 - 8)$
17. $\lim_{x \to \pi/2^-} \sin x$
18. $\lim_{x \to \pi^-} (3 \cos x)$
19. $\lim_{x \to 2^+} \dfrac{x^2 - 4}{x - 2}$
20. $\lim_{x \to 1^-} \dfrac{x^3 - x}{x - 1} = \dfrac{x^2(x-1)}{(x-1)} = (1)^2 = 1$
21. $\lim_{x \to -1^+} \dfrac{x^2 - 1}{x^3 + 1}$
22. $\lim_{x \to 0} \dfrac{x^3 - x^2}{x^4 + x^3} = \dfrac{x^2(x-1)}{x^3(x+1)}$ ↳ DNE
23. $\lim_{x \to -2^+} \dfrac{x^2 + x - 2}{x^2 + 2x}$
24. $\lim_{x \to -4^+} \dfrac{x^2 + x - 12}{x^2 + 4x}$

In Problems 25–40, determine whether f is continuous at c.

25. $f(x) = x^3 - 3x^2 + 2x - 6, \quad c = 2$ YES.
26. $f(x) = 3x^2 - 6x + 5, \quad c = -3$
27. $f(x) = \dfrac{x^2 + 5}{x - 6}, \quad c = 3$ YES
28. $f(x) = \dfrac{x^3 - 8}{x^2 + 4}, \quad c = 2$
29. $f(x) = \dfrac{x + 3}{x - 3}, \quad c = 3$ NOT CONTINUOUS $x \neq 3$ ASYMPTOTE
30. $f(x) = \dfrac{x - 6}{x + 6}, \quad c = -6$

1. $F(x) = 2x + 3$; continuous.

3. $F(x) = 3x^2 + x$ continuous.

5. $F(x) = 4 \sin x$ continuous.

7. $F(x) = 2 \tan x$ DISCONTINUOUS at asymp. $x = \frac{\pi}{2} + \pi N$.

$F(x) = \dfrac{2x+5}{x^2-4} = \dfrac{2x+5}{(x-2)(x+2)}$ DISCONTINUOUS at VERTICAL ASYMPTOTE $x \neq 2, x \neq -2$

$F(x) = \dfrac{x-3}{\ln x}$ $\ln x \neq 0$ $e^0 \neq x$ $x \neq 1$ DISCONTINUOUS at VERTICAL ASYMPTOTE $x \neq 1$

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

$\lim_{x \to -1^+} \dfrac{x-1}{x^2-x+1} = \dfrac{-1-1}{(-1)^2-(-1)+1} = \dfrac{-2}{3}$ A HOLE

23 $\lim_{x \to -2^+} \dfrac{(x+2)(x-1)}{x(x+2)} = \dfrac{-2-1}{-2} = \dfrac{-3}{2}$ A HOLE

$x \neq -2$ HOLE $x \neq 0$ ASYMP

$\lim_{x \to 1^+} (2x+3)$ AS x APPROACHES 1 FROM THE RIGHT $F(x) = 2(1)+3 = 5$

$\lim_{x \to 1^-} (2x^3+5x)$ AS x APPROACHES 1 FROM THE LEFT $F(x) = 2(1)^3+5(1) = 7$

$\lim_{x \to \frac{\pi}{2}^+} (\sin x)$ AS x APPROACHES $\frac{\pi}{2}$ FROM THE RIGHT $F(x) = \sin\frac{\pi}{2} = 1$

$\lim_{x \to 2^+} \dfrac{x^2-4}{x-2}$ AS x APPROACHES 2 FROM THE RIGHT $\lim \dfrac{(x-2)(x+2)}{} = \lim (x+2) = 4$ (A HOLE)