Ch. 2 Review: 2-52 evens

2. $\lim_{x\to -2} \frac{x^2+1}{3x^2-2x+5} = \frac{4+1}{12+4+5} = \boxed{\frac{5}{21}}$

4. $\lim_{x\to 5} \sqrt[4]{9-x^2} = \sqrt[4]{9-5^2} = \sqrt[4]{-16} \to \boxed{\text{DNE}}$

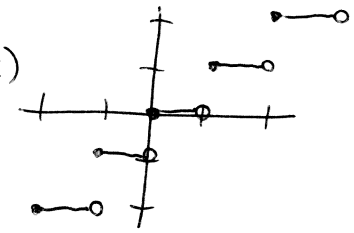
6. $\lim_{x\to \pm\infty} \frac{2x^2+3}{5x^2+7} = \frac{2x^2}{5x^2} = \boxed{\frac{2}{5}}$

8. $\lim_{x\to 0} \frac{\sin 2x}{4x} = \frac{1}{2}\lim_{x\to 0} \frac{\sin 2x}{2x} = \frac{1}{2}\lim_{x\to 0} \frac{\sin x}{x} = \frac{1}{2}\cdot 1 = \boxed{\frac{1}{2}}$

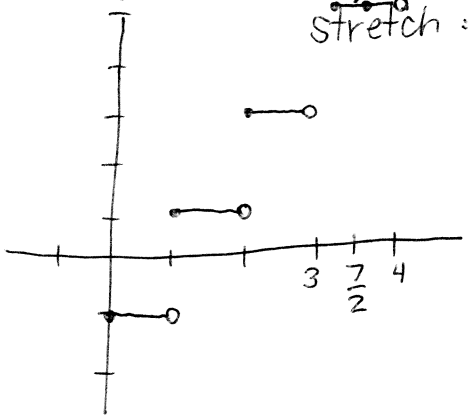
10. $\lim_{x\to 0} e^x \sin x = e^0 \cdot \sin 0 = 1\cdot 0 = \boxed{0}$

2. $\lim_{x\to \frac{7}{2}^-} \text{int}(2x-1)$

int(x)



int(2x-1): vertical shift: -1, stretch: ×2



$\boxed{5}$

14. $\lim_{x\to\infty} \frac{x+\sin x}{x+\cos x} = \lim_{x\to\infty} \frac{x\pm 1}{x\pm 1} = \lim_{x\to\infty} \frac{x}{x} = \boxed{1}$

16. Yes

18. No, $\lim_{x\to c^-} f(x) \neq \lim_{x\to c^+} f(x)$ (Jump)

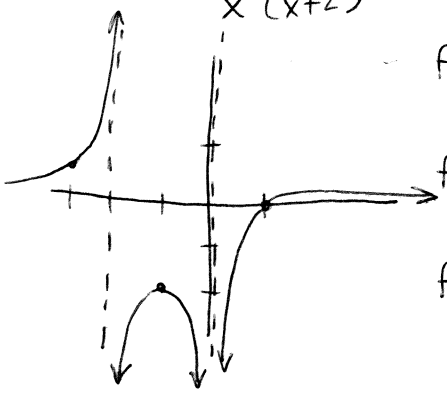
20. Yes

22. No, $\lim_{x\to b} f(x) \neq f(b)$ (Point Discontinuity)

24. Yes

26. a) 1.5
b) 0
c) 0
d) No
e) $x=1$ and x values not in domain
f) The discontinuity at $x=1$ is not removable bc $\lim_{x\to 1} k(x)$ DNE.

28. $f(x)=\frac{x-1}{x^2(x+2)}$ → VA at $x=-2$, $x=0$



$f(-3)=\frac{-4}{9(-1)}=\frac{4}{9}$

$f(-1)=\frac{-2}{1(1)}=-2$

$f(1)=\frac{0}{1(3)}=0$

$x=-2$: $\lim_{x\to -2^-} f(x)=\infty$

$\lim_{x\to -2^+} f(x)=-\infty$

$x=0$: $\lim_{x\to 0^-} f(x)=-\infty$

$\lim_{x\to 0^+} f(x)=-\infty$

30. $f(x)=\begin{cases} |x^3-4x|, & x<1 \\ x^2-2x-2, & x\geq 1 \end{cases}$

a) $\lim_{x\to 1^-} f(x)=|1^3-4(1)|=|1-4|=|-3|=3$

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

b) No bc $\lim_{x\to 1^-} f(x) \neq \lim_{x\to 1^+} f(x)$

c) All x except $x=1$

d) $x=1$

32. $g(x)=\sqrt[3]{3x+2}$

Continuous for all x

34. a) $\frac{2x^2}{x^2}$ → $y=2$

b) HA at $y=2$

36. a) $\frac{x^4}{x^3} \to y = x$

b) HA: none for $y = x$

38. $f(x) = \ln|x| + \sin x$

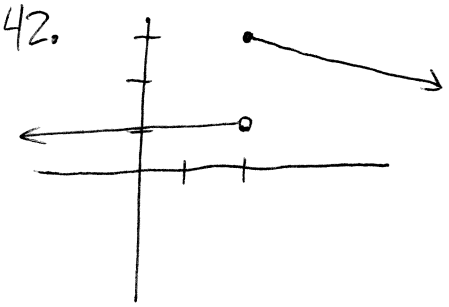
Right: $\lim_{x\to\infty} f(x) = \ln|\infty| + \sin\infty = \ln\infty \pm 1 \approx \ln\infty \to \boxed{\ln|x|}$

Left: $\lim_{x\to-\infty} f(x) = \ln|-\infty| + \sin(-\infty) = \ln\infty \pm 1 \approx \ln\infty \to \boxed{\ln|x|}$

40. $f(x) = \begin{cases} \frac{\sin x}{2x}, & x \neq 0 \\ k, & x = 0 \end{cases}$

$\frac{\sin x}{2x} = \frac{1}{2} \cdot \frac{\sin x}{x}$, so $\lim_{x\to0} \frac{1}{2} \cdot \frac{\sin x}{x} = \frac{1}{2} \cdot 1 = \boxed{\frac{1}{2} = k}$

42.



44. $V = \frac{1}{3}\pi r^2 H$ at $r = a \to V = \frac{H\pi}{3} r^2$

$$\lim_{h\to0} \frac{V(a+h) - V(a)}{h} = \lim_{h\to0} \frac{\frac{H\pi}{3}(a+h)^2 - \frac{H\pi}{3}a^2}{h}$$

$$\lim_{h\to0} \frac{\frac{H\pi}{3}(a^2 + 2ah + h^2) - \frac{H\pi}{3}a^2}{h} = \lim_{h\to0} \frac{H\pi}{3}(2a + h^{0}) = \boxed{\frac{2H\pi a}{3}}$$

46. $y = x^2 - x - 2$ at $x = a$

$$\lim_{h\to0} \frac{y(a+h) - y(a)}{h} = \lim_{h\to0} \frac{(a+h)^2 - (a+h) - 2 - a^2 + a + 2}{h}$$

$$\lim_{h\to0} \frac{a^2 + 2ah + h^2 - a - h - 2 - a^2 + a + 2}{h} = \lim_{h\to0} 2a + h^{0} - 1 = \boxed{2a - 1}$$

48. $\lim_{h\to 0} \frac{f(a+h)-f(a)}{h} = \lim_{h\to 0} \frac{(a+h)^2-3(a+h)-a^2+3a}{h}$

$\lim_{h\to 0} \frac{a^2+2ah+h^2-3a-3h-a^2+3a}{h} = \lim_{h\to 0} 2a+\frac{0}{h}-3 = 2a-3$

$2a-3=0$ when $a=3/2$

$f(3/2) = (3/2)^2-3(3/2) = \frac{9}{4}-\frac{9}{2} = \frac{9}{4}-\frac{18}{4} = \frac{-9}{4} \rightarrow \boxed{\left(\frac{3}{2}, \frac{-9}{4}\right)}$

50. a) $f(x) = \begin{cases} 0, & x=0 \\ 3.20-1.35\,\text{int}(1-x), & 0<x\le 20 \end{cases}$

b) Discontinuous at each integer bc price jumps each time a new mile starts.

52. $\lim_{x\to c}[f(x)+g(x)] = 2$

$\lim_{x\to c}[f(x)-g(x)] = 1$

$2\lim_{x\to c} f(x) = 3$, so $\lim_{x\to c} f(x) = \boxed{\frac{3}{2}}$

$\lim_{x\to c} f(x) + \lim_{x\to c} g(x) = 2 \rightarrow \lim_{x\to c} g(x) = 2-\frac{3}{2} = \boxed{\frac{1}{2}}$