HW 1-3

Read 1.3 (69-70)✓

1.3 (p71) 9, 17, 21, 23, 25*, 37, 49, 51, 53*, 57, 75*

Read 1.4 (74-80)✓

Find the Limit

9. $\lim_{x \to -3} (x^2 + 3x) = (-3)^2 + 3(-3) = 9 - 9 = 0$

17. $\lim_{x \to 2} \frac{3}{2x+1} = \frac{3}{2(2)+1} = \frac{3}{5}$

21. $\lim_{x \to 7} \frac{3x}{\sqrt{x+2}} = \frac{3(7)}{\sqrt{7+2}} = \frac{21}{\sqrt{9}} = 7$

23. $f(x) = 5 - x$ $\quad g(x) = x^3$

(a) $\lim_{x \to 1} f(x) = 5 - 1 = 4$

(b) $\lim_{x \to 4} g(x) = 4^3 = 64$

(c) $\lim_{x \to 1} g(f(x)) = g(4) = 64$

25. $f(x) = 4 - x^2$ $\quad g(x) = \sqrt{x+1}$

(a) $\lim_{x \to 1} f(x) = 4 - 1^2 = 3$

(b) $\lim_{x \to 3} g(x) = \sqrt{3+1} = \sqrt{4} = 2$

(c) $\lim_{x \to 1} g(f(x)) = g(3) = 2$

37. $\lim_{x \to c} f(x) = \frac{2}{5}$ $\quad \lim_{x \to c} g(x) = 2$

(a) $\lim_{x \to c} [5g(x)] = 5(2) = 10$

(b) $\lim_{x \to c} [f(x) + g(x)] = \frac{2}{5} + 2 = \frac{2+10}{5} = \frac{12}{5}$

(c) $\lim_{x \to c} [f(x)g(x)] = \left(\frac{2}{5}\right)(2) = \frac{4}{5}$

(d) $\lim_{x \to c} \frac{f(x)}{g(x)} = \frac{2/5}{2} = \frac{2}{5} \cdot \frac{1}{2} = \frac{1}{5}$

(49) $\lim\limits_{x \to 4} \dfrac{x-4}{x^2-16}$ by direct means we have $\frac{0}{0}$ indet. form

$$\lim_{x \to 4} \frac{x-4}{(x-4)(x+4)} = \lim_{x \to 4} \frac{1}{x+4} = \frac{1}{4+4} = \frac{1}{8}$$

(51) $\lim\limits_{x \to -3} \dfrac{x^2+x-6}{x^2-9}$ ($\frac{0}{0}$ indet. form)

$$\lim_{x \to -3} \frac{(x+3)(x-2)}{(x+3)(x-3)} = \lim_{x \to -3} \frac{x-2}{x-3} = \frac{-3-2}{-3-3} = \frac{5}{6}$$

(53) $\lim\limits_{x \to 4} \dfrac{\sqrt{x+5}-3}{x-4}$ ($\frac{0}{0}$ indeterm. form)

$$\lim_{x \to 4} \frac{(\sqrt{x+5}-3)}{x-4} \cdot \frac{(\sqrt{x+5}+3)}{(\sqrt{x+5}+3)}$$

$$\lim_{x \to 4} \frac{(x+5)-9}{(x-4)(\sqrt{x+5}+3)} = \lim_{x \to 4} \frac{(x-4)}{(x-4)(\sqrt{x+5}+3)} = \frac{1}{\sqrt{4+5}+3}$$

$\left(= \frac{1}{6}\right)$

(57) $\lim\limits_{\Delta x \to 0} \dfrac{2(x+\Delta x)-2x}{\Delta x}$ (indet. $\frac{0}{0}$ form)

$$\lim_{\Delta x \to 0} \frac{2x+2(\Delta x)-2x}{(\Delta x)} = \lim_{\Delta x \to 0} \frac{2(\Delta x)}{(\Delta x)} = 2$$

(75) $\lim\limits_{x \to 0} \dfrac{\sqrt{x+2}-\sqrt{2}}{x}$ ($\frac{0}{0}$ is an indeterminat form)

using numeric:

x	$-.1$	$-.01$	$-.001$	0	$.001$	$.01$	$.001$
$f(x)$	.35809	.354	.3536	?	.35351	.3534	.34924

about .35355

Analytic

$$\lim_{x \to 0} \frac{(\sqrt{x+2}-\sqrt{2})}{x} \frac{(\sqrt{x+2}+\sqrt{2})}{(\sqrt{x+2}+\sqrt{2})} =$$

$$\lim_{x \to 0} \frac{(x+2)-2}{x(\sqrt{x+2}+\sqrt{2})}$$

$$\lim_{x \to 0} \frac{(x)}{(x)(\sqrt{x+2}+\sqrt{2})} = \frac{1}{\sqrt{0+2}+\sqrt{2}} = \frac{1}{2\sqrt{2}} = \frac{\sqrt{2}}{4}$$

($\approx .354$ BTW)