P. 511 #44, 46, 58, 60 answers
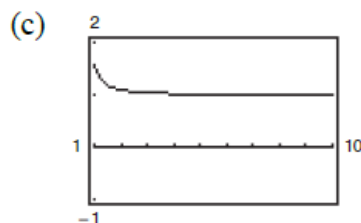
44. (a) $\lim\limits_{x\to 0^+} x^3 \cot x = (0)(\infty)$

(b) $\lim\limits_{x\to 0^+} x^3 \cot x = \lim\limits_{x\to 0^+} \dfrac{x^3}{\tan x} = \lim\limits_{x\to 0^+} \dfrac{3x^2}{\sec^2 x} = 0$

(c)
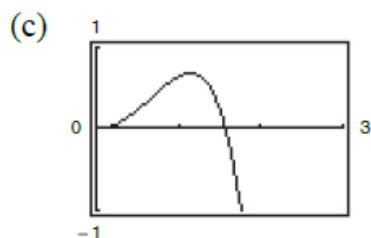
46. (a) $\lim\limits_{x\to\infty}\left(x\tan\dfrac{1}{x}\right) = (\infty)(0)$

(b) $\lim\limits_{x\to\infty} x\tan\dfrac{1}{x} = \lim\limits_{x\to\infty}\dfrac{\tan(1/x)}{1/x}$

$\phantom{(b)\ \lim\limits_{x\to\infty} x\tan\dfrac{1}{x}} = \lim\limits_{x\to\infty}\dfrac{-\left(1/x^2\right)\sec^2(1/x)}{-\left(1/x^2\right)}$

$\phantom{(b)\ \lim\limits_{x\to\infty} x\tan\dfrac{1}{x}} = \lim\limits_{x\to\infty}\sec^2\dfrac{1}{x} = 1$

(c)

58. (a) $\lim\limits_{x\to 2^+}\left(\dfrac{1}{x^2-4}-\dfrac{\sqrt{x-1}}{x^2-4}\right) = \infty - \infty$

(b) $\lim\limits_{x\to 2^+}\left(\dfrac{1}{x^2-4}-\dfrac{\sqrt{x-1}}{x^2-4}\right) = \lim\limits_{x\to 2^+}\dfrac{1-\sqrt{x-1}}{x^2-4}$

$ = \lim\limits_{x\to 2^+}\dfrac{-1/\left(2\sqrt{x-1}\right)}{2x}$

$ = \lim\limits_{x\to 2^+}\dfrac{-1}{4x\sqrt{x-1}} = -\dfrac{1}{8}$

(c)
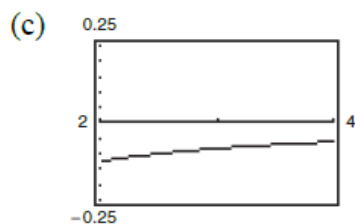
60. (a) $\lim\limits_{x\to 0^+}\left(\dfrac{10}{x}-\dfrac{3}{x^2}\right) = \infty - \infty$

(b) $\lim\limits_{x\to 0^+}\left(\dfrac{10}{x}-\dfrac{3}{x^2}\right) = \lim\limits_{x\to 0^+}\left(\dfrac{10x-3}{x^2}\right) = -\infty$

(c)