(97)

a) $\lim_{x\to-\infty} \frac{-12x^2+7x+1}{(2x+1)(1-4x)} = \lim_{-x\to\infty} \frac{-12x^2-7x+1}{(-2x+1)(1+4x)} = \left[\frac{\infty}{\infty}\right] = \lim_{-x\to\infty} \frac{-12-\cancel{\frac{7}{x}}^{\to 0}+\cancel{\frac{1}{x^2}}^{\to 0}}{-8+\cancel{\frac{2}{x}}^{\to 0}+\cancel{\frac{1}{x^2}}^{\to 0}} = \frac{12}{8} = \frac{3}{2}$

b) $\lim_{x\to\infty} (2x-\sqrt{4x^2+3x}) = [\infty-\infty] = \lim_{x\to\infty} \frac{(2x-\sqrt{4x^2+3x})(2x+\sqrt{4x^2+3x})}{(2x+\sqrt{4x^2+3x})} =$

$= \lim_{x\to\infty} \frac{\cancel{4x^2}-\cancel{4x^2}-3x}{(2x+\sqrt{4x^2+3x})} = \lim_{x\to\infty} \frac{-3}{2+\sqrt{4+\cancel{\frac{3}{x}}^{\to 0}}} = \frac{-3}{2+\sqrt{4}} = -\frac{3}{4}$

c) $\lim_{x\to+\infty} \frac{x\sqrt{x^2+1}\,\sqrt[3]{x^3+1}}{(2x+1)^3} = \left[\frac{\infty}{\infty}\right] = \lim_{x\to\infty} \frac{\sqrt{x^4+x^2}\,\sqrt[3]{x^3+1}}{(2x+1)^3} \lim_{x\to\infty} \frac{\sqrt[6]{(x^4+x^2)^3(x^3+1)^2}}{(2x+1)^3} = \frac{1}{8}$

d) $\lim_{x\to3^+} \frac{x^2+6x+9}{x-3} = \frac{18}{0} = +\infty$

e) $\lim_{x\to\infty} (\sqrt{x^2+x}-\sqrt{x^2-x}) = [\infty-\infty] = \lim_{x\to\infty} \frac{(\sqrt{x^2+x}-\sqrt{x^2-x})(\sqrt{x^2+x}+\sqrt{x^2-x})}{\sqrt{x^2+x}+\sqrt{x^2-x}} =$

$= \lim_{x\to\infty} \frac{\cancel{x^2}+x-\cancel{x^2}+x}{\sqrt{x^2+x}+\sqrt{x^2-x}} = \lim_{x\to\infty} \frac{2x}{\sqrt{x^2+x}+\sqrt{x^2-x}} = \lim_{x\to\infty} \frac{2}{\sqrt{1+\frac{1}{x}}+\sqrt{1-\frac{1}{x}}} = \frac{2}{\sqrt{1}+\sqrt{1}} = 1$

f) $\lim_{x\to\infty} \sqrt{x}(\sqrt{x+a}-\sqrt{x}) = \lim_{x\to\infty} \sqrt{x^2+ax} - x = [\infty-\infty] =$

$= \lim_{x\to\infty} \frac{[\sqrt{x^2+ax}-x][\sqrt{x^2+ax}+x]}{\sqrt{x^2+ax}+x} = \lim_{x\to\infty} \frac{\cancel{x^2}+ax-\cancel{x^2}}{\sqrt{x^2+ax}+x} = \frac{a}{\sqrt{1}+1} = \frac{a}{2}$

g) $\lim_{x\to-\infty} (\sqrt{x^2+2}-\sqrt{x^2+x}) = [\infty-\infty] = \lim_{-x\to\infty} \frac{(\sqrt{x^2+2}-\sqrt{x^2-x})(\sqrt{x^2+2}+\sqrt{x^2-x})}{\sqrt{x^2+2}+\sqrt{x^2-x}} =$

$= \lim_{-x\to\infty} \frac{\cancel{x^2}+2-\cancel{x^2}+x}{\sqrt{x^2+2}+\sqrt{x^2-x}} = \frac{1}{\sqrt{1}+\sqrt{1}} = \frac{1}{2}$

h) $\lim_{x\to2} \frac{x^2-7x+10}{x-2} = \left[\frac{0}{0}\right] = \lim_{x\to2} \frac{\cancel{(x-2)}(x-5)}{\cancel{(x-2)}} = \lim_{x\to2} (x-5) = -3$

i) $\lim_{x\to+\infty} \left(\frac{x+2}{x}\right)^{x-1} = [1^\infty] = e^{\lim_{x\to\infty} \left(\frac{x+2}{x}-1\right)(x-1)} = e^{\lim_{x\to\infty} \left(\frac{\cancel{x}+2-\cancel{x}}{x}\right)(x-1)} =$

$= e^{\lim_{x\to\infty} \frac{2x-2}{x}} = e^2$

j) $\lim_{x\to3} \left(\frac{x+5}{x-1}\right)^{x-1} = \left(\frac{8}{2}\right)^2 = 4^2 = 16$