p.205 $\lim_{x\to\infty}$ is a horizontal asymptote.

(14) a) $\lim_{x\to\infty} \frac{-4x^2+2x-5}{x} \approx \frac{-4x^2}{x} = -\infty$

Because the exponent on top is larger as x goes to infinity, y grows w/o bound

b) $\lim_{x\to\infty} \frac{-4x^2+2x-5}{x^2} \approx \frac{-4x^2}{x^2} = \frac{-4}{1} = -4$

Because the top and bottom have the same exponent, you use the coefficients

c) $\lim_{x\to\infty} \frac{-4x^2+2x-5}{x^3} \approx \frac{-4x^2}{x^3} = 0$

Because the exponent on bottom is larger, as x goes to infinity, y gets smaller

(16) a) $\lim_{x\to\infty} \frac{3-2x}{3x^3-1} \approx \frac{-2x+3}{3x^3} = 0$ (larger exp in bottom)

b) $\lim_{x\to\infty} \frac{3-2x}{3x-1} \approx \frac{-2x+3}{3x-1} = -\frac{2}{3}$ (same exp., use coefficient)

c) $\lim_{x\to\infty} \frac{3-2x^2}{3x-1} \approx \frac{-2x^2+3}{3x-1} = -\infty$ (larger exp on top)

(20) $\lim_{x\to-\infty} \frac{5}{x} - \frac{x}{3} = \frac{5}{\infty} - \frac{-\infty}{3}$ ($\frac{5}{\infty} \to$ goes to 0; $\frac{-\infty}{3} \to$ goes to ∞) $\approx 0+\infty = \infty$

(28) $\lim_{x\to\infty} \frac{x}{\sqrt{x^2+1}} \approx \frac{x}{\sqrt{x^2}} \approx \frac{x}{|x|} = \frac{\infty}{|\infty|} = 1$

(30) $\lim_{x\to-\infty} \frac{-3x+1}{\sqrt{x^2+1}} \approx \frac{-3x}{\sqrt{x^2}} \approx \frac{-3x}{|x|} = \frac{3\infty}{|-\infty|} = 3$

(32) $\lim_{x\to-\infty} \frac{\sqrt{x^4+1}}{x^3-1} \approx \frac{\sqrt{x^4}}{x^3} \approx \frac{x^2}{x^3} = 0$ (larger exp on bottom)

(34) $\lim_{x\to-\infty} \frac{2x}{(x^6+1)^{1/3}} \approx \frac{2x}{(x^6)^{1/3}} \approx \frac{2x}{x^{6/3}} \approx \frac{2x}{x^2} = 0$

(36) $\lim_{x\to\infty} \cos\frac{1}{\infty} \approx \cos 0 = 1$ (goes to 0)

(38) $\lim_{x\to\infty} \frac{x-\cos x}{x} = \frac{x}{x} - \frac{\cos x}{x} = 1 - \frac{\cos x}{\infty} = 1$

(40) Find the horizontal asymptotes using a calculator

$f(x) = \frac{|3x+2|}{x-2}$

$\lim_{x\to\infty} \frac{|3x|}{x} = 3$ $\lim_{x\to-\infty} \frac{|3(-\infty)|}{-\infty} = -3$

$y=3$ as $x\to\infty$ $y=-3$ as $x\to-\infty$

(80) $f(x) = \frac{-x^3-2x^2+2}{2x^2}$ $g(x) = -\frac{1}{2}x+1-\frac{1}{x^2}$

b) verify algebraically f and g are the same

$f(x) = \left(\frac{x^3}{2x^2} - \frac{2x^2}{2x^2} + \frac{2}{2x^2}\right)$

$-\left(\frac{x}{2} - 1 + \frac{1}{x^2}\right)$

$\frac{-x}{2} + 1 - \frac{1}{x^2}$