pg 206 # 13-23 odd

(13) (a) $\lim_{x\to\infty} \frac{x^2+2}{x^3+1} = \lim_{x\to\infty} \frac{\frac{x^2}{x^3}+\frac{2}{x^3}}{\frac{x^3}{x^3}+\frac{1}{x^3}}$

$= \lim_{x\to\infty} \frac{\frac{1}{x}+\frac{2}{x^3}}{1+\frac{1}{x^3}}$ ($\frac{1}{x}\to 0$, $\frac{2}{x^3}\to 0$, $\frac{1}{x^3}\to 0$)

$= \frac{0}{1} = \boxed{0}$.

← Divide each term by the ← largest power of ← x in the denominator ↙ ↓ ↓

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

$= \lim_{x\to\infty} \frac{1+\frac{2}{x^2}}{1-\frac{1}{x^2}}$ ($\frac{2}{x^2}\to 0$, $\frac{1}{x^2}\to 0$)

$= \frac{1}{1} = \boxed{1}$.

(c) $\lim_{x\to\infty} \frac{x^2+2}{x-1} = \lim_{x\to\infty} \frac{\frac{x^2}{x}+\frac{2}{x}}{\frac{x}{x}-\frac{1}{x}}$

$= \lim_{x\to\infty} \frac{x+\frac{2}{x}}{1-\frac{1}{x}}$ ($\frac{2}{x}\to 0$, $\frac{1}{x}\to 0$)

$= \lim_{x\to\infty} \frac{x}{1}$

$= \frac{\infty}{1} = \boxed{\infty}$.

(15) (a) $\lim_{x\to\infty} \frac{5-2x^{3/2}}{3x^2-4} = \lim_{x\to\infty} \frac{\frac{5}{x^2} - \frac{2x^{3/2}}{x^2}}{\frac{3x^2}{x^2} - \frac{4}{x^2}}$

$= \lim_{x\to\infty} \frac{\frac{5}{x^2} - \frac{2}{x^{1/2}}}{3 - \frac{4}{x^2}}$ ($\frac{5}{x^2}\to 0$, $\frac{4}{x^2}\to 0$)

$= \frac{0}{3} = \boxed{0}$

(b) $\lim_{x\to\infty} \frac{5-2x^{3/2}}{3x^{3/2}-4} = \lim_{x\to\infty} \frac{\frac{5}{x^{3/2}} - \frac{2x^{3/2}}{x^{3/2}}}{\frac{3x^{3/2}}{x^{3/2}} - \frac{4}{x^{3/2}}}$

$= \lim_{x\to\infty} \frac{\frac{5}{x^{3/2}} - 2}{3 - \frac{4}{x^{3/2}}}$ ($\frac{5}{x^{3/2}}\to 0$, $\frac{4}{x^{3/2}}\to 0$)

$= \boxed{-\frac{2}{3}}$

(c) $\lim_{x\to\infty} \frac{5-2x^{3/2}}{3x-4} = \lim_{x\to\infty} \frac{\frac{5}{x} - \frac{3x^{3/2}}{x}}{\frac{3x}{x} - \frac{4}{x}} = \lim_{x\to\infty} \frac{\frac{5}{x} - 3x^{1/2}}{3 - \frac{4}{x}}$ ($\frac{5}{x}\to 0$, $\frac{4}{x}\to 0$)

$= \lim_{x\to\infty} \frac{-3x^{1/2}}{3} = \frac{-3(\infty)}{3} = \boxed{-\infty}$

(17) $\lim_{x\to\infty} (4+\frac{3}{x}) = 4+0 = \boxed{4}$

(19) $\lim_{x\to\infty} \frac{7x+6}{9x+4} = \lim_{x\to\infty} \frac{\frac{7x}{x} + \frac{6}{x}}{\frac{9x}{x} + \frac{4}{x}} = \lim_{x\to\infty} \frac{7 + \frac{6}{x}}{9 + \frac{4}{x}}$ ($\frac{6}{x}\to 0$, $\frac{4}{x}\to 0$) $= \boxed{\frac{7}{9}}$

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

$= \lim_{x\to-\infty} \frac{\frac{2}{x}+\frac{1}{x^2}\to 0}{6+\frac{2}{x}+\frac{1}{x^2}\to 0} = \frac{0}{6} = \boxed{0}$

(23) $\lim_{x\to(-\infty)} \frac{5x^2}{x+3} = \lim_{x\to(-\infty)} \frac{\frac{5x^2}{x}}{\frac{x}{x}+\frac{3}{x}} = \lim_{x\to(-\infty)} \frac{5x}{1+\frac{3}{x}\to 0} = \frac{-\infty}{1} = \boxed{-\infty}$