180 - HOMEWORK

SECTION 2.5

(16) $\lim_{\theta \to 0} (2 - \cot\theta) = \lim_{\theta \to 0} \left(2 - \frac{\cos\theta}{\sin\theta}\right)$

$\lim_{\theta \to 0^+} (2 - \cot\theta) = \lim_{\theta \to 0^+} \left(2 - \frac{\cos\theta}{\sin\theta}\right)$

$= 2 - \frac{1}{+0} = -\infty$

$\lim_{\theta \to 0^-} (2 - \cot\theta) = \lim_{\theta \to 0^-} \left(2 - \frac{\cos\theta}{\sin\theta}\right)$

$= 2 - \frac{1}{0^-} = +\infty$

So $\lim_{\theta \to 0} (2 - \cot\theta)$ doesn't exist

(19) (a) $\lim_{x \to 0^+} \left(\frac{x^2}{2} - \frac{1}{x}\right) = 0 - \frac{1}{0^+} = 0 - \infty = \boxed{-\infty}$

(b) $\lim_{x \to 0^-} \left(\frac{x^2}{2} - \frac{1}{x}\right) = 0 - \frac{1}{0^-} = 1 - (-\infty) = \boxed{+\infty}$

(c) $\lim_{x \to \sqrt[3]{2}} \left(\frac{x^2}{2} - \frac{1}{x}\right) = \frac{\left(2^{\frac{1}{3}}\right)^2}{2} - \frac{1}{2^{\frac{1}{3}}}$

$= 2^{\frac{2}{3}-1} - 2^{-\frac{1}{3}}$

$= 2^{-\frac{1}{3}} - 2^{-\frac{1}{3}} = \boxed{0}$

(d) $\lim_{x \to -1} \left(\frac{x^2}{2} - \frac{1}{x}\right) = \frac{1}{2} - \frac{1}{-1} = \frac{1}{2} + 1 = \boxed{\frac{3}{2}}$

(22)

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

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

$= \frac{1}{2 \cdot 4} = \boxed{\frac{1}{8}}$

(b) $\lim_{x \to -2^+} \frac{x^2 - 3x + 2}{x^3 - 4x}$

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

$= \frac{-2-1}{-2(0^+)} = \frac{3}{2(0^+)} = \boxed{\infty}$

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

(d) $\lim_{x \to 1^+} \frac{x^2 - 3x + 2}{x^3 - 4x} = \frac{1 - 3 + 2}{1 - 4} = \frac{0}{-3} = \boxed{0}$

(e) $\lim_{x \to 0^-} \frac{x^2 - 3x + 2}{x^3 - 4x} = \infty$ (from (c))

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

So $\lim_{x \to 0} \frac{x^2 - 3x + 2}{x^3 - 4x}$ doesn't exist