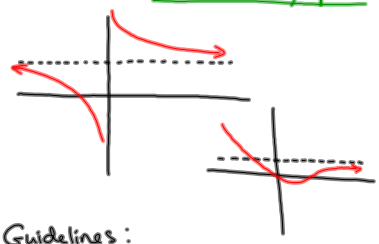
Limits at Infinity (3.5)

→ a function value (y-value) as x approaches ∞ or $-\infty$

→ these are horizontal Asymptotes



Guidelines:

Look at the degree of the Numerator & Denominator.

1) If deg. of top > deg. of bottom there is NO H.A.

2) If deg of top = deg. of bottom the H.A. = leading coefficient of the top divided by lead. coeff. of bottom.

ex) $f(x) = \frac{3x^2+7x+1}{2x^2+5}$

H.A. $\boxed{y = 3/2}$

3) If deg. top < deg. bottom, then the H.A. is $y=0$

ex) $f(x) = \frac{3x^3-4x+2}{x^4+1}$

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ex1) Find H.A. for

$$f(x) = \frac{2x^3+3x^2+1}{10x^3-3x}$$

Divide all terms by the highest power of Denom. → x^3

$$\lim_{x\to\infty} \frac{\frac{2x^3}{x^3} + \frac{3x^2}{x^3} + \frac{1}{x^3}}{\frac{10x^3}{x^3} - \frac{3x}{x^3}}$$

$$\lim_{x\to\infty} \frac{2 + \frac{3}{x} + \frac{1}{x^3}}{10 - \frac{3}{x^2}} = \frac{2+0+0}{10-0} = \frac{1}{5}$$

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2) Find all H.A. for

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

$\lim_{x\to\infty} f(x)$ & $\lim_{x\to-\infty} f(x)$

$$\frac{\frac{3x}{x} - \frac{2}{x}}{\frac{\sqrt{2x^2+1}}{\sqrt{x^2}}}$$

$$= \frac{3}{\sqrt{2}}$$

$$\frac{\frac{3x}{x} - \frac{2}{x}}{\frac{\sqrt{2x^2+1}}{-\sqrt{x^2}}}$$

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

Find all HA for

$$f = \frac{\sqrt{5x^2+3}}{4-2x}$$

$\lim_{x\to\infty} f = \frac{-\sqrt{5}}{2}$

$\lim_{x\to-\infty} f = \frac{\sqrt{5}}{2}$

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3) Find HA's for $g(x) = \frac{\sqrt{5x^4+2x^2+1}}{x^2-x+2}$

$\lim_{x\to\infty} g(x) = \sqrt{5}$

$\lim_{x\to-\infty} g(x) = -\sqrt{5}$

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P197 Trig Limits

1) $\lim_{x \to \pm\infty} \cos x = DNE$

2) $\lim_{x \to \infty} \frac{\sin x}{x} = 0$

$$-\frac{1}{x} \leq \frac{\sin x}{x} \leq \frac{1}{x}$$

$$0 \leq \lim_{x \to \pm\infty} \frac{\sin x}{x} \leq 0$$

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1-6, 13-31 odd

Nov 5-11:46 AM