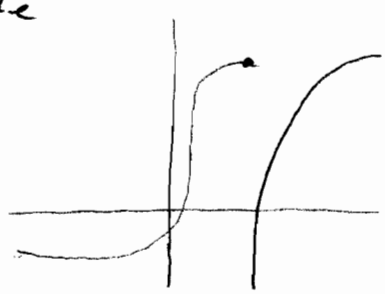
3-0235 — 50 SHEETS — 5 SQUARES
3-0236 — 100 SHEETS — 5 SQUARES
3-0237 — 200 SHEETS — 5 SQUARES
3-0137 — 200 SHEETS — FILLER
COMET

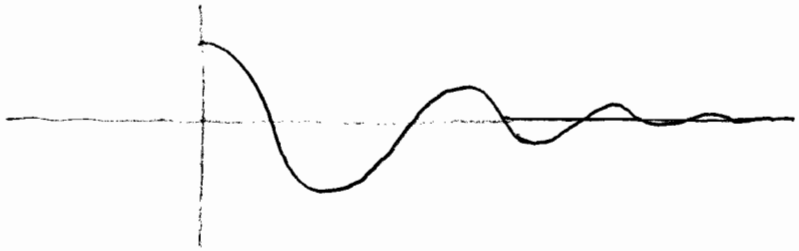
1.) a. As x gets large, f(x) approaches 5.
Horizontal asymptote at $y = 5$

b. As x gets very large in the negative direction, f(x) approaches 3.
Horiz asymptote at $y = 3$.

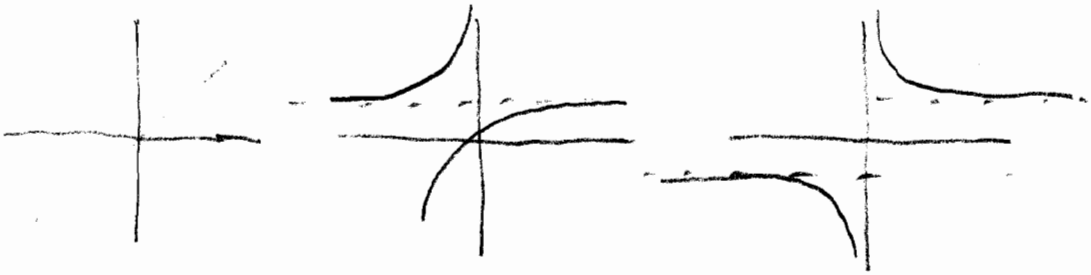
2 a. A graph can meet, but not cross a vertical asymptote



A graph <u>can</u> intersect a horizontal asymptote



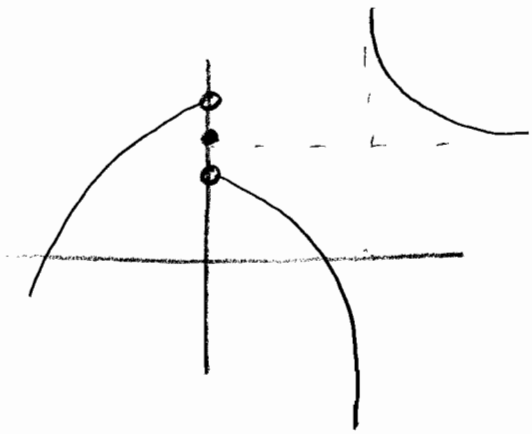
b. It can have 0, 1 or 2 horizontal asymptotes



4) a. 2 b. −2 c. ∞ d. $-\infty$ e. $-\infty$

f. $y = 2$, $y = -2$, $x = 0$, $x = -2$, $x = 3$

9)



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12) Use window [0, 10,000] by [0, 0.2]

$\lim_{x \to \infty} f(x) \approx 0.14$

b.

x	$f(x)$
10,000	.135308
100,000	.135333
1,000,000	.135335

17) $\lim_{x \to -\infty} \frac{1-x-x^2}{2x^2-7} = \lim \frac{\frac{1}{x^2} - \frac{x}{x^2} - \frac{x^2}{x^2}}{\frac{2x^2}{x^2} - 7/x^2}$

$= \lim_{x \to -\infty} \frac{\frac{1}{x^2} - \frac{1}{x} - 1}{2 - 7/x^2}$

$= -1/2$

20) $\lim_{t \to -\infty} \frac{t^2+3}{t^3+t^2-1} = \lim_{t \to -\infty} \frac{\frac{t^2}{t^3} + \frac{3}{t^3}}{\frac{t^3}{t^3} + \frac{t^2}{t^3} - \frac{1}{t^3}}$

$= \lim_{t \to -\infty} \frac{\frac{1}{t} + \frac{3}{t^3}}{1 + \frac{1}{t} - \frac{1}{t^3}}$

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

42) Vert asymptotes when denom is zero

$x^2 - x^4 = 0$

$x^2(1-x^2) = 0$

$\boxed{x=0, x=1, x=-1 \text{ vertical asymptotes}}$

Horiz asymptotes

$\lim_{x \to \infty} f(x) = \lim_{x \to \infty} \frac{1+x^4}{x^2-x^4} = \lim_{x \to \infty} \frac{\frac{1}{x^4} + \frac{x^4}{x^4}}{\frac{x^2}{x^4} - \frac{x^4}{x^4}} = \lim_{x \to -} \frac{\frac{1}{x^4} + 1}{\frac{1}{x^2} - 1}$

$= \frac{1}{-1} = -1 \quad \therefore$ $\boxed{\text{horizontal asymptote at } y=-1}$

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55) $\lim_{x\to\infty} \frac{P(x)}{Q(x)}$ where P & Q are polynomial

a. if $\deg(P) < \deg(Q)$ then the numerator goes to zero but the denominator does not, so

$$\lim_{x\to\infty} \frac{P(x)}{Q(x)} = 0$$

b. if $\deg(P) > \deg(Q)$ then numerator goes to $\pm\infty$ but denominator does not, so

$$\lim_{x\to\infty} \frac{P(x)}{Q(x)} = \pm\infty$$

57) $\frac{10e^x - 21}{2e^x} < f(x) < \frac{5\sqrt{x}}{\sqrt{x-1}}$ for all $x > 1$

find $\lim_{x\to\infty} f(x)$

Use squeeze theorem

$$\lim_{x\to\infty} \frac{10e^x - 21}{2e^x} = \lim_{x\to\infty} \left[\frac{10e^x}{2e^x} - \frac{21}{2e^x}\right]$$

$$= \lim_{x\to\infty} \left[5 - \frac{21}{2e^x}\right]$$

$$= 5 \quad \text{because } \lim_{x\to\infty} \frac{21}{2e^x} = 0$$

$$\lim_{x\to\infty} \frac{5\sqrt{x}}{\sqrt{x-1}} = \lim_{x\to\infty} \frac{5\sqrt{x}\,(1/\sqrt{x})}{\sqrt{x-1}\,(1/\sqrt{x})}$$

$$= \lim_{x\to\infty} \frac{5}{\frac{\sqrt{x-1}}{\sqrt{x}}}$$

$$= \lim_{x\to\infty} \frac{5}{\sqrt{1 - \frac{1}{\sqrt{x}}}} = \frac{5}{\sqrt{1}} = 5$$

By the squeeze theorem $\lim_{x\to\infty} f(x) = 5$