Sec 2.5 page 132 (1-10, 15-28, 33)

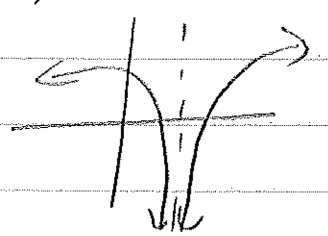
1) a) As the graph of $f(x)$ approaches $x=2$, $f(x)$ approaches infinity. (vertical assymptote.)

b) As the graph of $f(x)$ approaches 1 coming from the right, $f(x)$ approaches $-\infty$ (vertical assym)

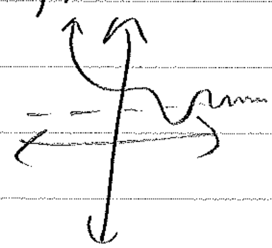
c) As x approaches infinity, $f(x)$ approaches 5 (horizontal assymptote)

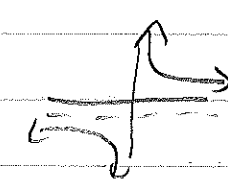
d) As x approaches negative infinity, $f(x)$ approaches 3. (horizontal assymptote)

2) a) no, it would not be a function



yes, it remains a function





b) horizontal 0, 1, or 2

vertical, 0 to infinity, tangent graph

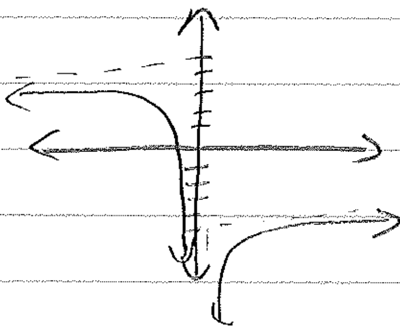
3) a) ∞ b) ∞ c) $-\infty$ d) 1 e) 2

f) $x=-1$, $x=2$, $y=1$, $y=2$

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

5) $x=-2$, $x=0$, $x=3$, $y=-2$, $y=2$

(5)



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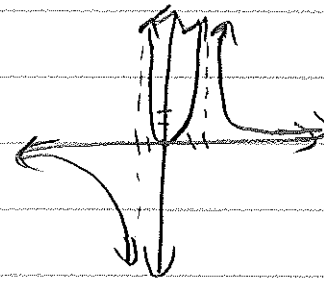

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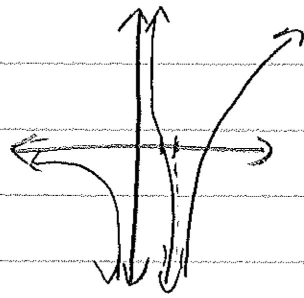
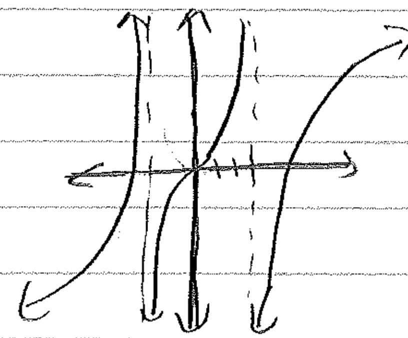
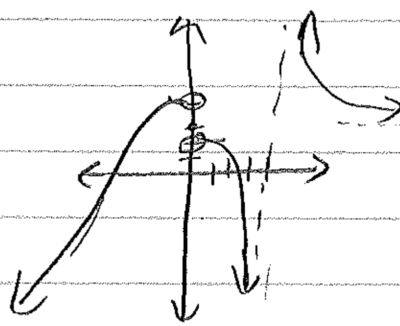


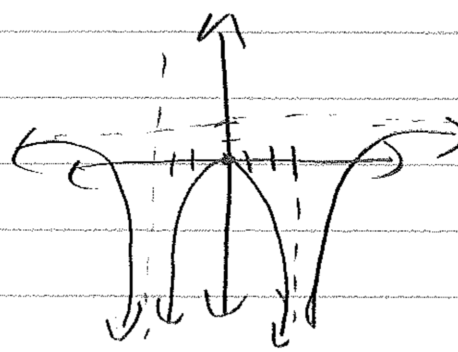
(8)



(9)



(10)



(15) $\lim\limits_{x\to 1} \dfrac{2-x}{(x-1)^2} \Rightarrow \dfrac{+}{0} = \infty$

(16) $\lim\limits_{x\to -3^-} \dfrac{x+2}{x+3} \Rightarrow \dfrac{-}{-0} = \infty$

(17) $\lim_{x \to 2^+} e^{2/2-x} \Rightarrow \frac{2}{2-x} \Rightarrow \frac{+}{-} = -\infty$

$\lim_{t \to -\infty} e^t = \boxed{0}$

(18) $\lim_{x \to \pi^-} \cot x = \boxed{-\infty}$ (look at graph)

or $\lim_{x \to \pi^-} \frac{\cos x}{\sin x} = \frac{-1}{0} = \boxed{-\infty}$

(19) $\lim_{x \to 3^+} \ln(x^2-9) = \lim_{t \to 0^+} \ln t = \boxed{-\infty}$

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

(21) $\lim_{x \to 2\pi^-} x \csc x = \lim_{x \to 2\pi^-} \frac{x}{\sin x} = \frac{+}{-0} = \boxed{-\infty}$

(22) $\lim_{x \to \infty} \frac{3x+5}{x-4} = \lim_{x \to \infty} \frac{\frac{3x}{x} + \frac{5}{x}}{\frac{x}{x} - 4/x} = \boxed{3}$

(23) $\lim_{x \to \infty} \frac{x^3+5x}{2x^3-x^2+4} = \boxed{\frac{1}{2}}$

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

(25) $\lim_{u \to \infty} \frac{4u^4+5}{(u^2-2)(2u^2-1)} = \lim_{u \to \infty} \frac{4u^4+5}{2u^4-5u^2+3} = \frac{4}{2} = \boxed{2}$

(26) $\lim_{x \to \infty} \frac{x+2}{\sqrt{9x^2+1}} = \boxed{\frac{1}{3}}$

(27) $\lim_{x \to \infty} (\sqrt{9x^2+x} - 3x)\left(\frac{\sqrt{9x^2+x}+3x}{\sqrt{9x^2+x}+3x}\right)$

$\lim_{x \to \infty} \frac{9x^2+x-9x^2}{\sqrt{9x^2+x}+3x} = \frac{1}{3+3} = \boxed{\frac{1}{6}}$

(28) $\lim_{x \to \infty} (\sqrt{x^2+ax} - \sqrt{x^2+bx})\left(\frac{\sqrt{x^2+ax}+\sqrt{x^2+bx}}{\sqrt{x^2+ax}+\sqrt{x^2+bx}}\right)$

$\lim_{x \to \infty} \frac{x^2+ax-x^2+bx}{\sqrt{x^2+ax}+\sqrt{x^2+bx}} = \frac{ax-bx}{\sqrt{x^2+ax}+\sqrt{x^2+bx}} = \boxed{\frac{a-b}{2}}$

☆ (33) $\lim_{x \to \infty} (e^{-2x}\cos x)$ $\quad -1 \le \cos x \le 1$ and $e^{-2x} > 0$

we know that $-e^{-2x} \le e^{-2x}\cos x \le e^{-2x}$

$\lim_{x \to \infty} -e^{-2x} = 0 \quad \lim_{x \to \infty} e^{-2x} = 0$

$\therefore$ by squeeze theorem $e^{-2x}\cos x \to 0$