

2.2

$$21) \lim_{x \rightarrow \infty} \left(2 - \frac{x}{x+1}\right) \left(\frac{x^2}{5+x^2}\right)$$

$$\lim_{x \rightarrow \infty} \left(2 - \frac{x}{x+1}\right) \left(\frac{x^2}{5+x^2}\right)$$

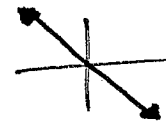
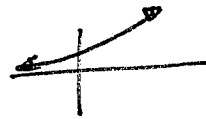
$$\lim_{x \rightarrow \infty} \left(2 - \frac{x}{x+1}\right) \cdot \lim_{x \rightarrow \infty} \left(\frac{x^2}{5+x^2}\right)$$

$$1 \cdot 1 = 1$$

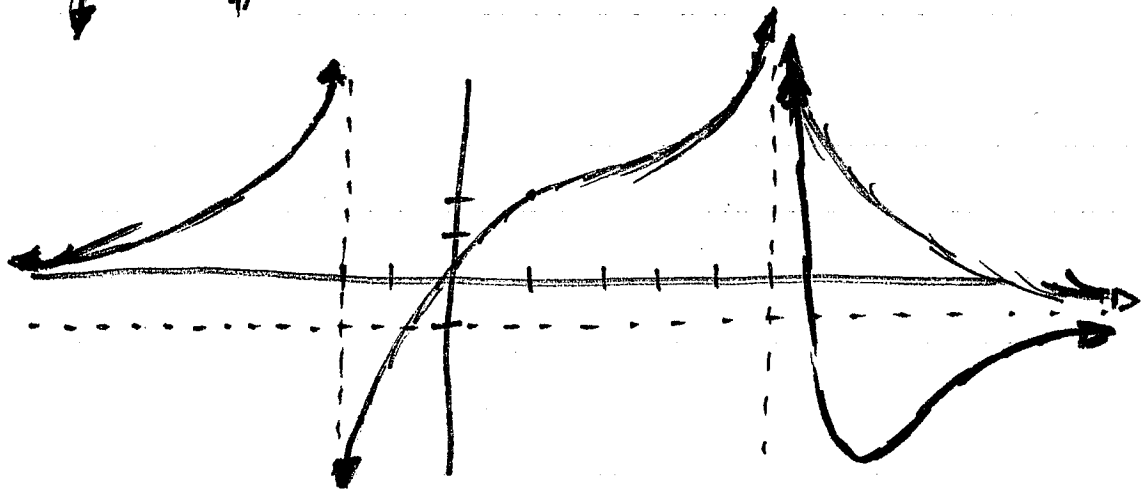
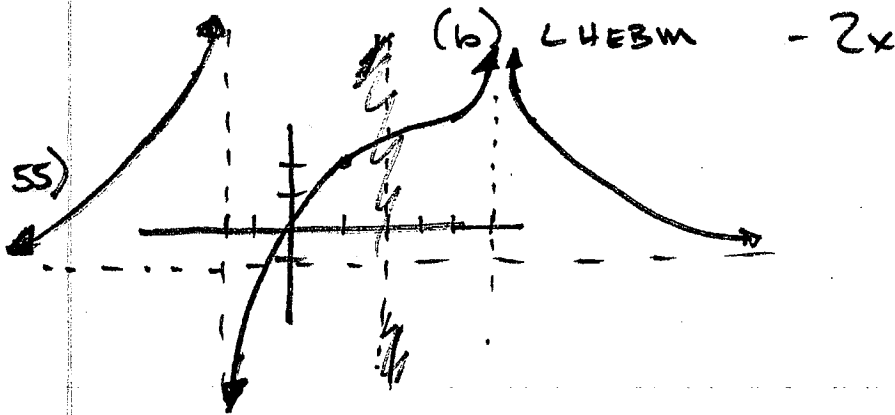
$$1 \cdot 1 = 1$$

45)  $y = e^x - 2x$

(a)   $x \rightarrow \infty$



RIGHT-HAND END BEHAVIOR MODEL  $e^x$



$$\lim_{x \rightarrow 1} f(x) = 2$$

$$\lim_{x \rightarrow -\infty} f(x) = 0$$

$$\lim_{x \rightarrow 5^+} f(x) = \infty$$

$$\lim_{x \rightarrow 5^-} f(x) = \infty$$

$$\lim_{x \rightarrow -2^-} f(x) = \infty$$

$$\lim_{x \rightarrow -2^+} f(x) = -\infty$$

$$\lim_{x \rightarrow 0} f(x) = -1$$

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$$70) \lim_{x \rightarrow \infty} \frac{\ln x}{\log x}$$

$$\lim_{x \rightarrow \infty} \frac{\frac{\log x}{\log e}}{\log x}$$

$$\lim_{x \rightarrow \infty} \frac{\log x}{\log e} \cdot \frac{1}{\log x}$$

$$\lim_{x \rightarrow \infty} \frac{1}{\log e} = \frac{1}{\log e}$$

$$\log_5 12 = \frac{\ln 12}{\ln 5}$$

$$9) \lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2} = 0$$

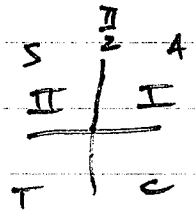
$$33) f(x) = \frac{\tan x}{\sin x} = \frac{\frac{\sin x}{\cos x}}{\sin x} = \frac{\sin x}{\cos x} \cdot \frac{1}{\sin x} = \frac{1}{\cos x} = \sec x$$

$$\frac{\pi}{2} \pm \pi k$$

$$\frac{\pi}{2} \pm \pi n$$

$$x \rightarrow \frac{\pi}{2}^- \rightarrow \infty$$

$$x \rightarrow \frac{\pi}{2}^+ \rightarrow -\infty$$



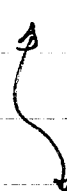
$$53) f(x) = \begin{cases} 1/x, & x < 0 \\ -1, & x \geq 0 \end{cases}$$

$$\lim_{x \rightarrow -\infty} f(x) = 0$$

$$\lim_{x \rightarrow \infty} f(x) = -1$$

$$\lim_{x \rightarrow 0^-} f(x) = -\infty$$

$$\lim_{x \rightarrow 0^+} f(x) = -1$$



$$40) f(x) = -4x^3 + x^2 - 2x - 1$$

$$\text{EBM } -4x^3$$

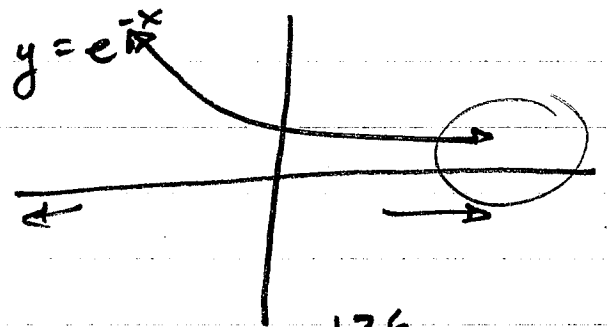
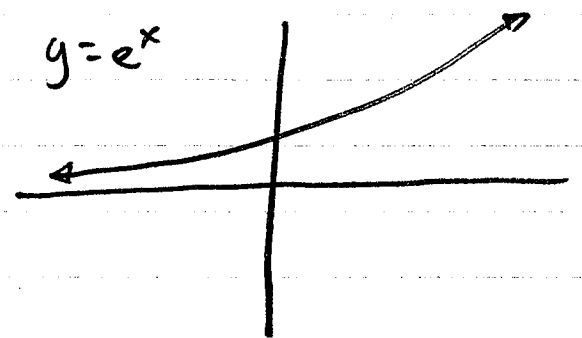
$$\lim_{x \rightarrow \infty} -4x^3 = -\infty$$



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46)  $y = x^2 + e^{-x}$

LEFT-END B.M.  
 $y = e^{-x}$

RIGHT-END B.M.  
 $y = x^2$



49)  $\lim_{x \rightarrow \infty} x e^x = \infty$   
 $\lim_{x \rightarrow \infty} \frac{1}{x} e^{\frac{1}{x}} = \infty$

$\lim_{x \rightarrow -\infty} x e^x = 0$   
 $\lim_{x \rightarrow 0} \frac{1}{x} e^{\frac{1}{x}} = 0$

$$\begin{array}{r} \frac{126}{3} \\ 3 \overline{) 126} \\ \underline{42} \\ 126 \\ \underline{126} \\ 0 \end{array}$$

3)  $\lim_{x \rightarrow \infty} \frac{e^{-x}}{x} = \frac{0}{\infty} = 0$

$\lim_{x \rightarrow -\infty} \frac{e^{-x}}{x} = \frac{\infty}{-\infty} = -\infty$

$y = 0$

57)  $\lim_{x \rightarrow \infty} \frac{f_1(x)}{f_2(x)} = \frac{g_1(x)}{g_2(x)}$

$f_1(x) = x^2 + 2x - 7$   
 $f_2(x) = 2x^2 - 4$

$g_1(x) = x^2$   
 $g_2(x) = 2x^2$

x	y
2	5
2	5
3	7
4	8

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$$2) \lim_{x \rightarrow \infty} \left( 2 - \frac{x}{x+1} \right) \left( \frac{x^2}{5+x^2} \right)$$

1 · 1  
①

$$\lim_{x \rightarrow -\infty} \left( 2 - \frac{x}{x+1} \right) \left( \frac{x^2}{5+x^2} \right) = \textcircled{1}$$

$$\lim_{x \rightarrow \infty} \left( 5 - \frac{x}{x+1} \right) \left( \frac{x^2}{5+x^2} \right)$$

4 · 1 = ④