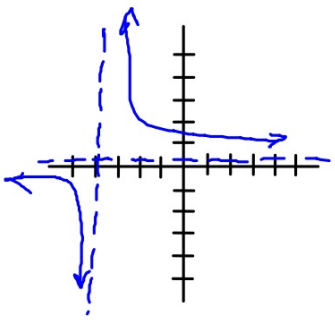
Limits Involving $\pm\infty$
Section 2.2

Review:

$f(x) = \dfrac{1}{x+4}$



$\lim_{x \to -4^-} f(x) = -\infty$

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

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

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

End Behavior Models

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

E.B.M. $y = \frac{3}{4}x$

$f(x) = \dfrac{14x^5 + 2x^3 - 1}{7x^3 - 2x^2}$

E.B.M. $y = 2x^2$

$f(x) = \dfrac{-6x^2 + 3x - 1}{5x + x^2}$

E.B.M. $y = -6$

Definition for Horizontal Asymptote:

H.A for $f(x)$ is $y=a$ and/or $y=b$

if $\lim_{x\to\infty} f(x)=a$ and $\lim_{x\to-\infty} f(x)=b$

Find the $\lim_{x\to\infty} f(x)$, $\lim_{x\to-\infty} f(x)$, and identify the horizontal asymptote.

1. $f(x)=\dfrac{x+3}{x^2-10x-24}$

E.B.M. $y=\dfrac{1}{x}$

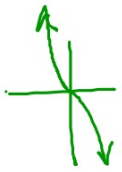
$\lim_{x\to\infty} f(x)=0$

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

} H.A. $y=0$

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

E.B.M. $y=-x^3$

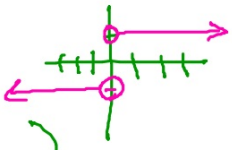


$\lim_{x\to\infty} f(x)=-\infty$ = d.n.e.

$\lim_{x\to-\infty} f(x)=\infty$ = d.n.e.

} H.A. d.n.e.

3. $f(x) = \dfrac{|x|}{x}$



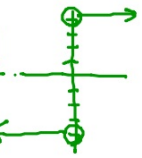
$\lim\limits_{x\to\infty} \dfrac{|x|}{x} = 1$

$\lim\limits_{x\to-\infty} \dfrac{|x|}{x} = -1$

H.A. $y=1, y=-1$

4. $f(x) = \dfrac{4|x|-2}{x+1}$

E.B.M. $y = \dfrac{4|x|}{x}$

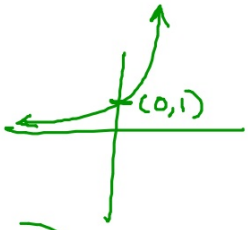


$\lim\limits_{x\to\infty} f(x) = 4$

$\lim\limits_{x\to-\infty} f(x) = -4$

H.A. $y = 4, y = -4$

5. $f(x) = e^x$

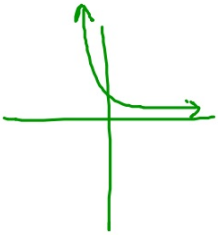


$\lim\limits_{x\to\infty} e^x = \infty$

$\lim\limits_{x\to-\infty} e^x = 0$

H.A. $y = 0$

6. $f(x) = e^{-x}$



$\lim\limits_{x\to\infty} e^{-x} = 0$

$\lim\limits_{x\to-\infty} e^{-x} = \infty$

$y = 0$

7. $f(x) = x^2 + e^x$

$\lim_{x\to\infty}(x^2 + e^x)$ $\infty + \infty = \infty$

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

H.A. d.n.e.

8. $f(x) = x^2 \cdot e^x$

$\lim_{x\to\infty}(x^2 \cdot e^x)$ $\infty \cdot \infty = \infty$

$\lim_{x\to-\infty}(x^2 \cdot e^x)$ $\infty \cdot 0 = 0$

H.A. $y = 0$

9. $f(x) = \dfrac{\cos x}{x}$

$\lim_{x\to\infty} \dfrac{\cos x}{x}$ $\dfrac{\text{small \#}}{\text{HUGE}} = 0$ $y = 0$

$\lim_{x\to-\infty} \dfrac{\cos x}{x}$ $\dfrac{\text{small \#}}{\text{HUGE}} = 0$ $y = 0$

H.A. $y = 0$

10. $f(x) = \dfrac{\sin\left(\frac{1}{x}\right)}{\frac{1}{x} + 2}$

$\lim_{x\to\infty} f(x) = \dfrac{0}{0+2} = \dfrac{0}{2} = 0$

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