Homework 2-6

① $\lim_{x\to-\infty} \frac{9x^2-5x-9}{9-3x-7x^2} \cdot \frac{1/x^2}{1/x^2}$

$\Rightarrow \frac{9-5/x-9/x^2}{9/x^2-3/x-7} = \frac{-9}{7}$

② $\lim_{x\to\infty} \frac{(9-x)(2+6x)}{(3-8x)(8+3x)}$

$\Rightarrow 9(2+6x)-x(2+6x)=$
$18+54x-2x-6x^2$

$\Rightarrow 3(8+3x)-8x(8+3x)$
$24+9x-64x-24x^2$

the highest coefficients are same then cancele

$\lim_{x\to\infty} \frac{6}{24} = \boxed{1/4}$ same w/ $-\infty$

③ $\lim_{x\to\infty} \frac{8x+5}{7x^2+7x+6} = 0$

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

④ $\lim_{x\to-\infty} \frac{12x^4-5x^2}{5x^5+8} = 0$

The numerators grow faster than den. $\frac{c}{\infty} = 0$

⑤ $\lim_{x\to\infty} -22x^2-16x^3 = -\infty$

$\lim_{x\to-\infty} -22x^2-16x^3 = \infty$

⑥ $\lim_{x\to\infty} \frac{4-7\sqrt{x}}{4+7\sqrt{x}} \cdot \frac{1/\sqrt{x}}{1/\sqrt{x}}$

$\Rightarrow \frac{4/\sqrt{x}-7}{4/\sqrt{x}+7} = \frac{-7}{7} = -1$

⑦ $\lim_{x\to\infty} \frac{\sqrt{x^4+10x^3+7}}{2x^2-5} \cdot \frac{1/x^2}{1/x^2}$

$\Rightarrow \frac{\sqrt{1+10/x+7/x^2}}{2-5/x^2} = \frac{\sqrt{1}}{2} = \boxed{\frac{1}{2}}$

⑧ $\lim_{x\to\infty} \frac{\sqrt{3+8x^2}}{2+6x} \cdot \frac{1/x}{1/x}$

$\Rightarrow \frac{\sqrt{3/x^2+8}}{2/x+6} = \frac{\sqrt{8}}{6} = \boxed{\frac{\sqrt{8}}{6}}$

⑨ $\lim_{x\to\infty} \sqrt{x^2+9x+1}-x$

$\Rightarrow \frac{(\sqrt{x^2+9x+1}-x)(\sqrt{x^2+9x+1}+x)}{\sqrt{x^2+9x+1}+x}$

$\Rightarrow \lim_{x\to\infty} \frac{9x+1}{\sqrt{x^2+9x+1}+x} \cdot \frac{1/x}{1/x}$

$\Rightarrow \frac{9+1/x}{\sqrt{1+9/x+1/x^2}+1} \Rightarrow$ take limit $\boxed{\frac{9}{2}}$

⑩ $\lim_{x\to\infty} 5x-8\sqrt{x} = \infty$

because x grows faster than $\sqrt{x}$

Homework Continued

(11) $\lim_{x\to\infty}\left(\sqrt{x^2+8}-\sqrt{x^2-3}\right)$

$$\frac{(x^2+8)-(x^2-3)}{\sqrt{x^2+8}+\sqrt{x^2-3}}=\frac{12}{f(x)}$$

$$\lim_{x\to\infty}\frac{12}{f(x)}=0 \quad \boxed{\frac{c}{\infty}=0}$$

(12) $\lim_{x\to\infty}\left(\sqrt{x^2-x+1}-x\right)$

$$\Rightarrow \frac{x^2-x+1-x^2}{\sqrt{x^2-x+1}+x} \Rightarrow \frac{1-x\cdot 1/x}{\sqrt{x^2-x+1}+x\cdot 1/x}$$

$$\Rightarrow \lim_{x\to\infty}\frac{-1}{\sqrt{1-1/x+1/x^2}+1} \Rightarrow \frac{-1}{2}$$

(12) $\lim_{x\to-\infty}\left(\sqrt{x^2-x+1}-x\right)$

$$\lim_{x\to\infty}\sqrt{x^2+x+1}+x=\boxed{\infty}$$

(13) $f(x)=\frac{3x+4}{x-5}$; Find HA & VA

$$\lim_{x\to\infty}\frac{3x+4}{x-5}=\boxed{\frac{3}{1}}$$

and vertical asymp $=\boxed{5}$

(14) $f(x)=\frac{3x^2+7x+10}{2x^2+7x-72}$

$$\lim_{x\to\infty}f(x)=\boxed{\frac{3}{2}}$$

and vertical asymp $=(2x-9)(x+8)$

$\frac{9}{2}$ and -8

(15) $f(x)=\frac{x+7}{2x^4}$

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

and vertical Asymp $=0$

(16) $f(x)=\frac{x}{x^2-36}$

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

and vertical Asymp $=(x+6)(x-6)$

$x=\pm 6$

(17) $f(x)=\frac{x^8}{x^2+8}$

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

and vertical Asymp $=$ NONE

(18) $\lim_{x\to\infty}\frac{8}{e^x+2}=\frac{c}{\infty}=0$

$$\lim_{x\to-\infty}\frac{8}{e^x+2}\Rightarrow\lim_{x\to\infty}\frac{8}{\frac{1}{e^x}+2}$$

then $\Rightarrow 4$

(19) $\lim_{x\to 2^+}e^{\frac{3}{2-x}}=0$

plug in small value to check makes sense

(20) $f(x)=$ odd fn and if

$$\lim_{x\to\infty}f(x)=33 \text{ then}$$

$$\lim_{x\to-\infty}f(x)=-33$$