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

A

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

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

$$= \lim_{x\to\infty} \frac{1-\sqrt{\frac{x^2+1}{x^2}}}{2+\frac{3}{x}} = \lim_{x\to\infty} \frac{1-\sqrt{1-\frac{1}{x^2}}}{2+\frac{3}{x}} = \frac{1-\sqrt{1-0}}{2+0} = \frac{1-1}{2} = 0$$

$y = 0$

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

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

$y = 1$

Homework 8:

4) $f(x) = \dfrac{x^{\frac{1}{3}} - 4}{x^{7/2}}$

$$f'(x) = \frac{x^{7/2}\left(\frac{1}{3}x^{-\frac{2}{3}}\right) - \left(x^{\frac{1}{3}} - 4\right)\left(\frac{7}{2}x^{\frac{5}{2}}\right)}{x^{7}}$$

$(x^{7/2})^2 = x^7$

$f(x) = x^{\frac{1}{3} - \frac{7}{2}} - 4x^{-\frac{7}{2}} = x^{\frac{2}{6} - \frac{21}{6}} - 4x^{-\frac{7}{2}} = x^{-\frac{19}{6}} - 4x^{-\frac{7}{2}}$

$f'(x) = -\frac{19}{6}x^{-\frac{25}{6}} + 14x^{-\frac{9}{2}}$

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

$$f'(x) = \frac{(x+3e^x)(2x - 2e^x) - (x^2 - 2e^x)(1 + 3e^x)}{(x+3e^x)^2}$$

Homework 9

2) $f(x) = -2\sin(x)$ @ $x = \frac{3}{4}\pi$

$f\left(\frac{3\pi}{4}\right) = -2\sin\left(\frac{3\pi}{4}\right) = -2 \cdot \frac{\sqrt{2}}{2}$

$= -\sqrt{2}$

$f'(x) = -2\cos x$

$f'\left(\frac{3\pi}{4}\right) = -2\cos\left(\frac{3\pi}{4}\right) = -2 \cdot -\frac{\sqrt{2}}{2} = \sqrt{2}$

$y + \sqrt{2} = \sqrt{2}\left(x - \frac{3\pi}{4}\right)$

FR #4

B

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

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

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

$y=-1$

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

$$=\lim_{x\to-\infty}\frac{1-\sqrt{\frac{x^2-1}{x^2}}}{\frac{4}{x}-2}=\lim_{x\to-\infty}\frac{1-\sqrt{1-\frac{1}{x^2}}}{\frac{4}{x}-2}=\frac{1-\sqrt{1}}{-2}=\frac{1-1}{-2}=\frac{0}{-2}=0$$

$y=0$