

Q6) Find ALL Horizontal Asymptotes for

$$f(x) = \frac{12x+5}{\sqrt{16x^2+x+1}}$$

$\lim_{x \rightarrow +\infty} \frac{12x+5}{\sqrt{16x^2+x+1}}$ → find the highest exponent term " x^2 " then div. ALL by $\sqrt{x^2} = |x|$

$$\lim_{x \rightarrow \infty} \frac{\frac{12x+5}{x}}{\sqrt{\frac{16x^2+x+1}{x^2}}}$$

if $x > 0$ x
 if $x < 0$ $-x$

$$= \lim_{x \rightarrow \infty} \frac{12 + \frac{5}{x}}{\sqrt{16 + \frac{1}{x} + \frac{1}{x^2}}} = \lim_{x \rightarrow \infty} \frac{12}{\sqrt{16}} = \frac{12}{4} = 3$$

$$y = 3$$

$$\lim_{x \rightarrow -\infty} \frac{12x+5}{\sqrt{16x^2+x+1}} = \lim_{x \rightarrow -\infty} \frac{\frac{12x+5}{x}}{-\sqrt{\frac{16x^2+x+1}{x^2}}}$$

$$= \lim_{x \rightarrow -\infty} \frac{12+0}{-\sqrt{16+0+0}} = \frac{12}{-4} = -3$$

$$y = -3$$

The H.A. of $f(x)$ are: $y = 3, y = -3$