Bellwork 9/25

Find the limits:

1. $$\lim_{x\to\infty}\left(\frac{3x^2 - x + 1}{4x - 2}\right)$$
2. $$\lim_{x\to-\infty}\left(\frac{2x+1}{3x+1}\right)$$
3. $$\lim_{x\to-\infty}\left(\frac{6x^3+7x+3}{5x^4+6x^2+2x}\right)$$

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Bellwork 9/25 - Solution, Part 1

$$\lim_{x\to\infty}\left(\frac{3x^2 - x + 1}{4x - 2}\right) = \lim_{x\to\infty}\left(\frac{3x - \frac{1\cancel{x}}{\cancel{x}} + \frac{1}{x}}{\frac{4\cancel{x}}{\cancel{x}} - \frac{2}{x}}\right)$$

$$= \lim_{x\to\infty}\left(\frac{3x - 1 + \frac{1}{x}}{4 - \frac{2}{x}}\right) = \frac{3(\infty) - 1 + 0}{4 - 0} = \boxed{\infty}$$

Bellwork 9/25 - Solution, Part 2

$$\lim_{x\to-\infty}\left(\frac{2x+1}{3x+1}\right) = \lim_{x\to-\infty}\left(\frac{\frac{2\cancel{x}}{\cancel{x}}+\frac{1}{x}}{\frac{3\cancel{x}}{\cancel{x}}+\frac{1}{x}}\right)$$

$$= \lim_{x\to-\infty}\left(\frac{2+\frac{1}{x}}{3+\frac{1}{x}}\right) = \frac{2+0}{3+0} = \boxed{\frac{2}{3}}$$

Bellwork 9/25 - Solution, Part 3

$$\lim_{x \to -\infty} \left(\frac{6x^3 + 7x + 3}{5x^4 + 6x^2 + 2x} \right) = \lim_{x \to -\infty} \left(\frac{\frac{6x^3}{x^4} + \frac{7x}{x^4} + \frac{3}{x^4}}{\frac{5\cancel{x^4}}{\cancel{x^4}} + \frac{6x^2}{x^4} + \frac{2x}{x^4}} \right)$$

$$= \lim_{x \to -\infty} \left(\frac{\frac{6}{x} + \frac{7}{x^3} + \frac{3}{x^4}}{5 + \frac{6}{x^2} + \frac{2}{x^3}} \right) = \frac{0 + 0 + 0}{5 + 0 + 0} = \boxed{0}$$

Exercise 1

Find the limits:

1. $$\lim_{x\to\infty}\left(\frac{3x^3-7}{2x^3-x+1}\right)$$

2. $$\lim_{x\to\infty}\left(\frac{3x^2-7}{2x^3-x+1}\right)$$

Exercise 1 - Solutions

1. $$\lim_{x\to\infty}\left(\frac{3x^3-7}{2x^3-x+1}\right)=\lim_{x\to\infty}\left(\frac{\frac{3\cancel{x^3}}{\cancel{x^3}}-\frac{7}{x^3}}{\frac{2\cancel{x^3}}{\cancel{x^3}}-\frac{x}{x^3}+\frac{1}{x^3}}\right)$$
$$=\lim_{x\to\infty}\left(\frac{3-\frac{7}{x^3}}{2-\frac{1}{x^2}+\frac{1}{x^3}}\right)=\frac{3-0}{2-0+0}=\boxed{\frac{3}{2}}$$

2. $$\lim_{x\to\infty}\left(\frac{3x^2-7}{2x^3-x+1}\right)=\lim_{x\to\infty}\left(\frac{\frac{3x^2}{x^3}-\frac{7}{x^3}}{\frac{2\cancel{x^3}}{\cancel{x^3}}-\frac{x}{x^3}+\frac{1}{x^3}}\right)$$
$$=\lim_{x\to\infty}\left(\frac{\frac{3}{x}-\frac{7}{x^3}}{2-\frac{1}{x^2}+\frac{1}{x^3}}\right)=\frac{0-0}{2-0+0}=\boxed{0}$$

Exercise 2

Find the limit:

$$\lim_{x \to -\infty} \left[\frac{1 + e^x \sin(x)}{e^{x-1} - 1} \right]$$

Exercise 2 - Solution

$$\lim_{x \to -\infty} \left[\frac{1 + e^x \sin(x)}{e^{x-1} - 1} \right] = \frac{1+0}{0-1}$$

$$= \frac{1}{-1} = \boxed{-1}$$

Exercise 3

Find the limit:

$$\lim_{x\to\infty}\left(\frac{3^x+2}{e^{2x}+1}\right)$$

Exercise 3 - Solution

$$\lim_{x\to\infty}\left(\frac{3^x+2}{e^{2x}+1}\right)=\lim_{x\to\infty}\left(\frac{\frac{3^x}{e^{2x}}+\frac{2}{e^{2x}}}{\frac{\cancel{e^{2x}}}{\cancel{e^{2x}}}+\frac{1}{e^{2x}}}\right)$$

$$=\lim_{x\to\infty}\left[\frac{\left(\frac{3}{e^2}\right)^x+\frac{2}{e^{2x}}}{1+\frac{1}{e^{2x}}}\right]=\frac{0+0}{1+0}=\boxed{0}$$