

AP Calculus AB
Limits at Infinity Practice
HW 1-9

Name: Key

Find the limit.

$$1) \lim_{x \rightarrow \infty} \frac{5x^2 - 3x + 1}{2x^2 + 4x - 7}$$

$$\boxed{\frac{5}{2}}$$

$$2) \lim_{x \rightarrow \infty} \frac{3x^3 - x + 1}{6x^3 + 2x^2 - 7}$$

$$\frac{3}{6} = \boxed{\frac{1}{2}}$$

$$3) \lim_{x \rightarrow \infty} \frac{4x - 3}{\sqrt{x^2 + 1}}$$

$$\frac{\frac{4x-3}{x}}{\frac{\sqrt{x^2+1}}{\sqrt{x^2}}}$$

$$= \frac{4 - \frac{3}{x}}{\sqrt{1 + \frac{1}{x^2}}} = \frac{4 - 0}{\sqrt{1 + 0}} = \boxed{4}$$

$$4) \lim_{x \rightarrow -\infty} \frac{4 - 7x}{2 + 3x}$$

$$\boxed{\frac{-7}{3}}$$

$$5) \lim_{x \rightarrow \infty} \frac{2x^2 - x + 3}{x^3 + 1}$$

$$\boxed{0}$$

$$6) \lim_{x \rightarrow -\infty} \frac{\sqrt{x^2 + 2}}{x - 1}$$

$$\frac{\frac{x^2}{x}}{x} = x$$

$$= \boxed{-\infty}$$

$$7) \lim_{x \rightarrow -\infty} \frac{2 - x^2}{x + 3} = \frac{-x^2 + 2}{x + 3}$$

$$\frac{-x^2}{x} = -x$$

$$= \boxed{\infty}$$

$$8) \lim_{x \rightarrow \infty} \sqrt{\frac{8 + x^2}{x(x+1)}}$$

$$\frac{\sqrt{8+x^2}}{\sqrt{x(x+1)}} = \frac{\sqrt{8+x^2}}{\sqrt{x^2}}$$

$$= \frac{\sqrt{\frac{8}{x^2} + 1}}{\sqrt{\frac{x^2}{x^2} + \frac{x}{x^2}}} = \frac{\sqrt{\frac{8}{x^2} + 1}}{\sqrt{1 + \frac{1}{x}}}$$

$$= \frac{\sqrt{0 + 1}}{\sqrt{1 + 0}} = \boxed{1}$$

$$9) \lim_{x \rightarrow \infty} \cos x$$

DNE
(oscillating)

$$10) \lim_{x \rightarrow \infty} \left(-2x^3 + 1 - \frac{5}{x} + \frac{12}{x+4} \right)$$

plugin: ∞

$$= -\infty + 1 - 0 + 0 = \boxed{-\infty}$$

$$11) \lim_{x \rightarrow \infty} \left(\frac{-5}{2x^3} - 7 + \frac{8}{x} \right)$$

plugin: ∞

$$0 - 7 + 0 = \boxed{-7}$$

$$12) \lim_{x \rightarrow -\infty} \left(3 + \frac{5}{x^3} - \frac{7}{6x} \right)$$

plugin: $-\infty$

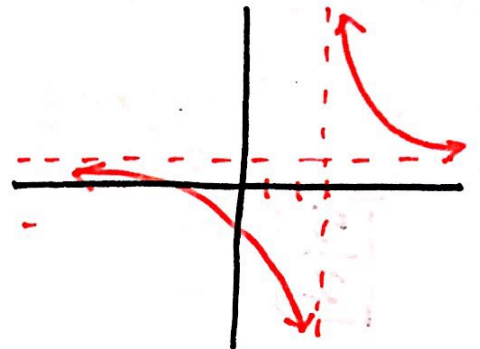
$$3 + 0 + 0 = \boxed{3}$$

$$13) \lim_{x \rightarrow \infty} \frac{\sin 4x}{3x} = \boxed{0}$$

Sketch a possible graph given the set of conditions. Assume the function does not cross a horizontal asymptote.

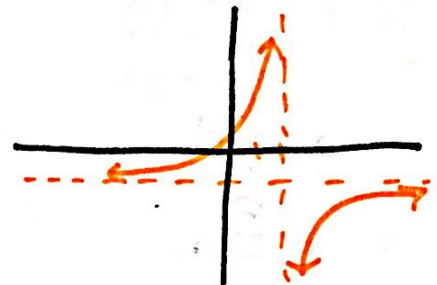
14) $\lim_{x \rightarrow -\infty} f(x) = 1$ $\lim_{x \rightarrow 3^-} f(x) = -\infty$

$\lim_{x \rightarrow \infty} f(x) = 1$ $\lim_{x \rightarrow 3^+} f(x) = \infty$



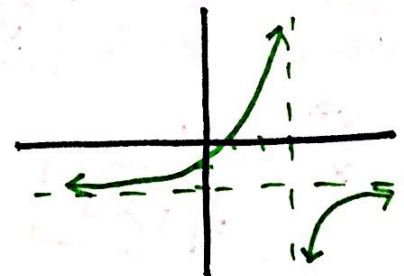
15) $\lim_{x \rightarrow -\infty} f(x) = -1$ $\lim_{x \rightarrow 2^-} f(x) = \infty$

$\lim_{x \rightarrow \infty} f(x) = -1$ $\lim_{x \rightarrow 2^+} f(x) = -\infty$



16) $\lim_{x \rightarrow -\infty} f(x) = -2$ $\lim_{x \rightarrow \infty} f(x) = -2$

$\lim_{x \rightarrow 3^-} f(x) = \infty$ $\lim_{x \rightarrow 3^+} f(x) = -\infty$



17) $\lim_{x \rightarrow -\infty} f(x) = 3$ $\lim_{x \rightarrow \infty} f(x) = 3$

$\lim_{x \rightarrow 1^-} f(x) = \infty$ $\lim_{x \rightarrow 1^+} f(x) = -\infty$

