AP Calculus-AB

Notes: Limits that Involve Infinity $(\infty)$ Limits, Continuity, & R.O.C Day 6

Remember:

Vertical Asymptotes: Set the denominator of a rational function equal to zero and solve for x.

Horizontal Asymptotes: To find, you compare the degree in numerator/denominator.

1. $\frac{\text{degree top smaller}}{\text{degree in bottom}}$ then

2. $\frac{\text{degree top equal}}{\text{degree in bottom}}$ then

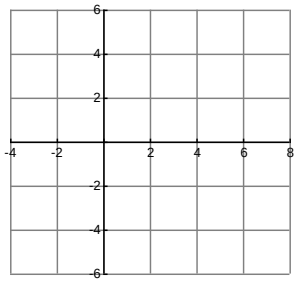
3. $\frac{\text{degree top larger}}{\text{degree in bottom}}$ then

Example(s) 1: Find all the asymptotes of each function

A.) $f(x)=\frac{4x+3}{2x-6}$

B.) $g(x)=\frac{3}{x-4}$

C.) $h(x)=\frac{x^2-4}{x^2-x-12}$



Let look at the graph of B.)

$g(x)=\frac{3}{x-4}$

How does this apply to calculus?

$\lim_{x\to 4^+} g(x) =$ _____

$\lim_{x\to 4^-} g(x) =$ _____

$\lim_{x\to \infty} g(x) =$ _____

$\lim_{x\to -\infty} g(x) =$ _____

How would you answer the same questions without using the graph?

$\lim_{x\to 4^+} \frac{3}{x-4} =$ _____ $\lim_{x\to 4^-} \frac{3}{x-4} =$ _____ $\lim_{x\to \infty} \frac{3}{x-4} =$ _____ $\lim_{x\to -\infty} \frac{3}{x-4} =$ _____

Example(s) 2: Evaluate each without a calculator.

A.) $\lim_{x\to 2^+} \frac{x+3}{x-2}$

B.) $\lim_{x\to 3^+} \ln(x-3)$

C.) $\lim_{x\to \infty} \frac{4x+1}{x-3}$

D.) $\lim_{t\to -\infty} \frac{t-1}{t^2-4}$

E.) $\lim_{x\to \infty} \frac{4x^2+1}{x-3}$

F.) $\lim_{x\to -\infty} \frac{4x^2+1}{x-3}$

G.) $\lim_{x\to -2^+} \frac{x}{x+2}$

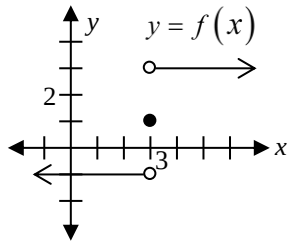
H.) $\lim_{x\to -2^-} \frac{x}{x+2}$

**1.** For the function $f$ graphed below, find:

**(a)** $\lim_{x\to 3^-} f(x)$ **(b)** $\lim_{x\to 3^+} f(x)$

**(c)** $\lim_{x\to 3} f(x)$ **(d)** $f(3)$

**(e)** $\lim_{x\to -\infty} f(x)$ **(f)** $\lim_{x\to +\infty} f(x)$

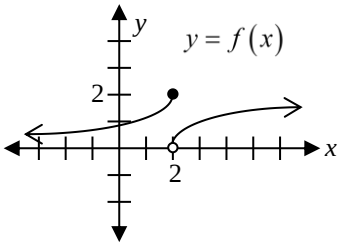



**2.** For the function $f$ graphed below, find:

**(a)** $\lim_{x\to 2^-} f(x)$ **(b)** $\lim_{x\to 2^+} f(x)$

**(c)** $\lim_{x\to 2} f(x)$ **(d)** $f(2)$

**(e)** $\lim_{x\to -\infty} f(x)$ **(f)** $\lim_{x\to +\infty} f(x)$

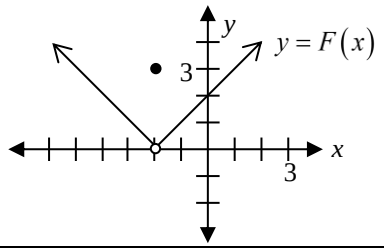



**3.** For the function $F$ graphed below, find:

**(a)** $\lim_{x\to -2^-} F(x)$ **(b)** $\lim_{x\to -2^+} F(x)$

**(c)** $\lim_{x\to -2} F(x)$ **(d)** $F(-2)$

**(e)** $\lim_{x\to -\infty} F(x)$ **(f)** $\lim_{x\to +\infty} F(x)$

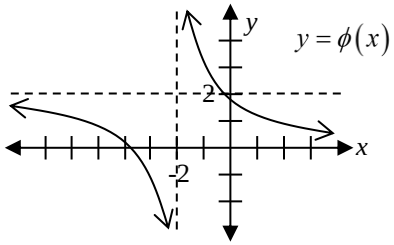



**4.** For the function $\phi$ graphed below, find:

**(a)** $\lim_{x\to -2^-} \phi(x)$ **(b)** $\lim_{x\to -2^+} \phi(x)$

**(c)** $\lim_{x\to -2} \phi(x)$ **(d)** $\phi(-2)$

**(e)** $\lim_{x\to -\infty} \phi(x)$ **(f)** $\lim_{x\to +\infty} \phi(x)$

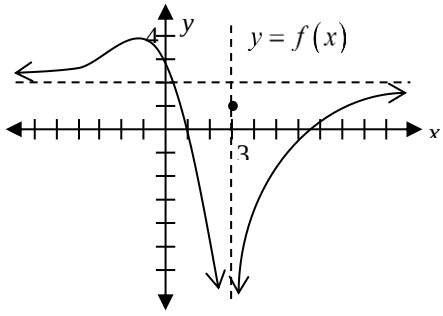



**5.** For the function $f$ graphed below, find:

**(a)** $\lim_{x\to 3^-} f(x)$ **(b)** $\lim_{x\to 3^+} f(x)$

**(c)** $\lim_{x\to 3} f(x)$ **(d)** $f(3)$

**(e)** $\lim_{x\to -\infty} f(x)$ **(f)** $\lim_{x\to +\infty} f(x)$

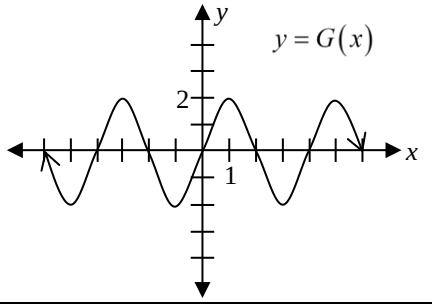



**6.** For the function $G$ graphed below, find:

**(a)** $\lim_{x\to 0^-} G(x)$ **(b)** $\lim_{x\to 0^+} G(x)$

**(c)** $\lim_{x\to 0} G(x)$ **(d)** $G(0)$

**(e)** $\lim_{x\to -\infty} G(x)$ **(f)** $\lim_{x\to +\infty} G(x)$

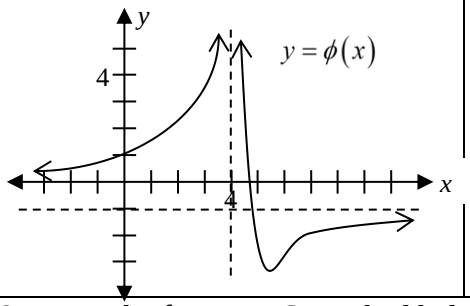



**7.** For the function $\phi$ graphed below, find:

**(a)** $\lim_{x\to 4^-} \phi(x)$ **(b)** $\lim_{x\to 4^+} \phi(x)$

**(c)** $\lim_{x\to 4} \phi(x)$ **(d)** $\phi(4)$

**(e)** $\lim_{x\to -\infty} \phi(x)$ **(f)** $\lim_{x\to +\infty} \phi(x)$

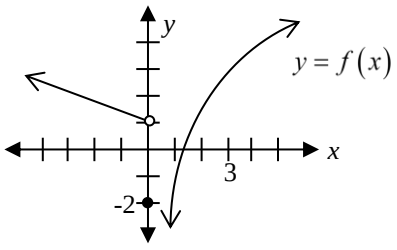



**8.** For the function $f$ graphed below, find:

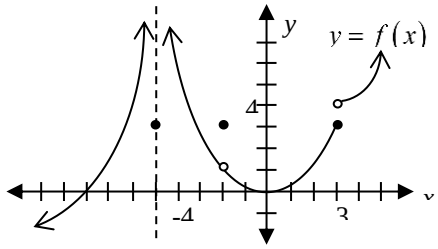
**(a)** $\lim_{x\to 0^-} f(x)$ **(b)** $\lim_{x\to 0^+} f(x)$

**(c)** $\lim_{x\to 0} f(x)$ **(d)** $f(0)$

**(e)** $\lim_{x\to -\infty} f(x)$ **(f)** $\lim_{x\to +\infty} f(x)$

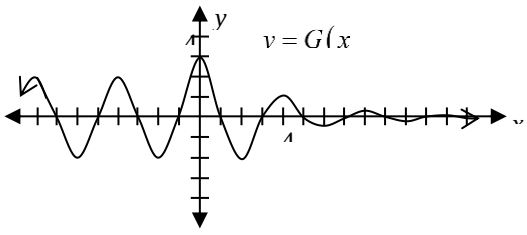



9. Consider the function $f$, graphed below. For what values of $x_0$ does $\lim_{x\to x_0} f(x)$ exist?




**8. .** For the function $G$ graphed below, find:

**(a)** $\lim_{x\to 0^-} G(x)$ **(b)** $\lim_{x\to 0^+} G(x)$

**(c)** $\lim_{x\to 0} G(x)$ **(d)** $G(0)$

**(e)** $\lim_{x\to -\infty} G(x)$ **(f)** $\lim_{x\to +\infty} G(x)$