Pre-Calculus Objective 2.08 Limits of Functions

1. The value of the expression $200\left(1+\frac{0.05}{k}\right)^{10k}$ gives the account balance if \$200 is invested for 10 years in an account that pays 5% annual interest that is compounded k times a year.

a) Find the account balance if $k = 4$, 12, 52, 356, 8760, or 525,600 compounded for each quarter, month, week, day, hour, minute.

b) What value does $200\left(1+\frac{0.05}{k}\right)^{10k}$ approach as k approaches infinity?

2. Let $f(x)=\frac{x+1}{(x-2)(x+3)}$. Use the table of values to determine what happens to $f\ (x)$ as $x \to -3$.

3. Describe the behavior of $f(x)=\frac{1}{x}\sin(x)$ for large, positive values of x.

4. Describe the behavior of $f(x)=\sin\left(\frac{\pi}{x}\right)$ as $x \to 0$.

5. Find the following limits without using a calculator:

a) $\lim_{x\to 2}\frac{2x^2-4x}{x^2-4}$

b) $\lim_{x\to 5}\frac{\frac{1}{x}-\frac{1}{5}}{x-5}$

c) $\lim_{x\to\infty}\frac{4n^2-5n}{3n^2+4}$

6. What value of n would make the function continuous? Show both graphically and algebraically.

$$f(x)=\begin{cases} x^2+1 & x<-1 \\ n & -1\le x\le 3 \\ 5-x & x>3 \end{cases}$$

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1. The value of the expression $200\left(1+\frac{0.05}{k}\right)^{10k}$ gives the account balance if \$200 is invested for 10 years in an account that pays 5% annual interest that is compounded k times a year.

a) Find the account balance if $k = 4$, 12, 52, 356, 8760, or 525,600 compounded for each quarter, month, week, day, hour, minute.

$k=4$ \$328.72 $k=52$ \$329.67 $k=8760$ \$329.74

$k=12$ \$329.40 $k=356$ \$329.73 $k=525,600$ \$329.74

b) What value does $200\left(1+\frac{0.05}{k}\right)^{10k}$ approach as k approaches infinity?

\$329.74

2. Let $f(x)=\frac{x+1}{(x-2)(x+3)}$. Use the table of values to determine what happens to $f(x)$ as $x \to -3$.

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

3. Describe the behavior of $f(x)=\frac{1}{x}\sin(x)$ for large, positive values of x.

$\lim_{x\to\infty} \frac{1}{x}\sin x = 0$

4. Describe the behavior of $f(x)=\sin\left(\frac{\pi}{x}\right)$ as $x \to 0$.

$\lim_{x\to 0} \sin\left(\frac{\pi}{x}\right) = 0$

5. Find the following limits without using a calculator:

a) $\lim_{x\to 2}\frac{2x^2-4x}{x^2-4} = \lim_{x\to 2}\frac{2x(x-2)}{(x-2)(x+2)} = \frac{4}{4} = 1$

b) $\lim_{x\to 5}\frac{\frac{5}{5}\cdot\frac{\frac{1}{x}-\frac{1}{5}}{x-5}\cdot\frac{x}{x}}{} = \lim_{x\to 5}\frac{\frac{5}{5x}-\frac{x}{5x}}{x-5} = \lim_{x\to 5}\frac{5-x}{5x}\cdot\frac{1}{x-5} = \lim_{x\to 5}\frac{-1(x-5)}{5x}\cdot\frac{1}{x-5} = \frac{-1}{25}$

c) $\lim_{x\to\infty}\frac{4n^2-5n}{3n^2+4} = \frac{4}{3}$

6. What value of n would make the function continuous? Show both graphically and algebraically.

$$f(x)=\begin{cases} x^2+1 & x<-1 \\ n & -1\le x\le 3 \\ 5-x & x>3 \end{cases}$$

$(-1)^2+1 = 2$ $5-3=2$

$n=2$ $n=2$

from left from right

needs to be the same value

$n=2$