KEY

Limits and Continuity Practice Problems

1. For $f(x) = \frac{x^2+4x+3}{x^2-3x-4}$, find the following:

a. $f(-1)$

DNE

b. $\lim_{x\to 1^-} f(x)$

$-\frac{2}{5}$

c. $\lim_{x\to 1^+} f(x)$

$-\frac{2}{5}$

d. $\lim_{x\to 1} f(x)$

$-\frac{2}{5}$

2. $\lim_{x\to -1} \frac{x^4-x^3-x^2-3x-4}{x^2-x-3}$

0

3. $\lim_{x\to 2} \frac{x^3-8}{x-2}$

12

4. $\lim_{x\to 0} \frac{\sqrt{x+1}-1}{x}$

$\frac{1}{2}$

5. $\lim_{x\to 0} \frac{x}{\frac{1}{6}+\frac{1}{x-6}}$

-36

6. $\lim_{x\to 0} \frac{-2\sin 4x}{x}$

-8

7. $\lim_{x\to 0} \frac{x+\sin x}{x}$

2

8. If $f(x) = x^2 + \cos(\pi x)$, prove that there is a solution for $f(x) = 4$ for some x on the interval [0,2].

$f(0) = 1$

$f(2) = 5$

Since $f(0)=1$ and $f(2)=5$ there must be an x value on the interval $[0,2]$ where $f(x)=4$ by the intermediate value theorem.

9. Given $\lim_{x\to 3} f(x) = 8$, $\lim_{x\to 3} g(x) = -2$, and $\lim_{x\to 3} h(x) = 0$, find:

a. $\lim_{x\to 3}[2f(x) - 4g(x)]$

$2(8) - 4(-2)$

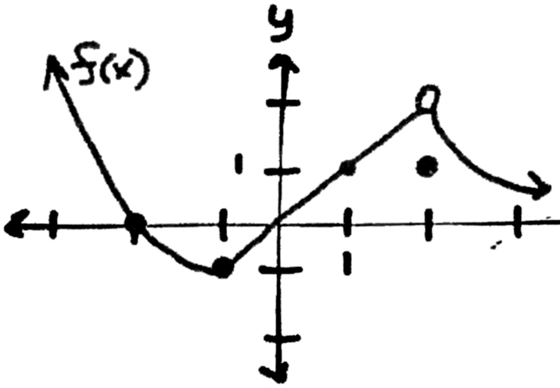
$16 + 8 = 24$

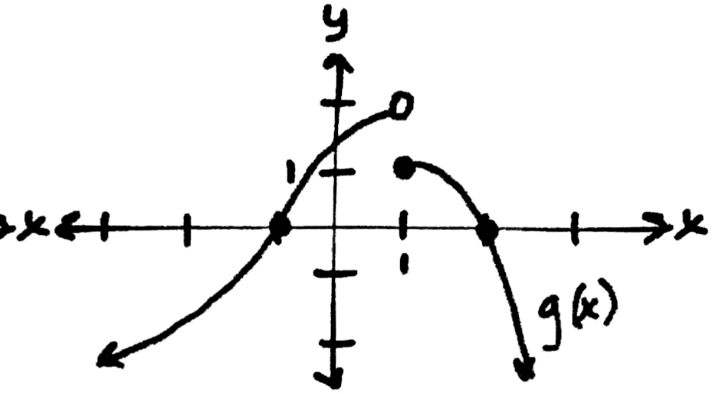
b. $\lim_{x\to 3}[2g(x)]^2$

$[2(-2)]^2$

$(-4)^2 = 16$

10. The graphs of *f* and *g* are given below. Use them to evaluate each limit, if it exist. If the limit does not exist write DNE.





a. $\lim_{x\to -1}[3[f(x)]^2 - 4g(x)]$

$3 - 0 = 3$

b. $\lim_{x\to 2}[(x +)^2 - g(x)]$

$9 - 0 = 9$

11. $\lim_{x\to\infty} -x^5 + 2x^3 - 4x^2 + 2$

$\cancel{\infty}$

$-\infty$

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

$-\infty$

13. $\lim_{x\to -\infty} \frac{4x}{\sqrt{9x^2+3}}$

$-\frac{4}{3}$

14. If $f(x) = \begin{cases} ae^x + b, x < 0 \\ 4, \ x = 0 \\ bx - 2a, x > 0 \end{cases}$, find the value of b that makes $f(x)$ continuous at $x = 0$. If there is no such value, write DNE.

$a = -2$

$b = 6$

15. If $f(x) = \frac{1}{x-2}$ and $\lim_{x\to(-k+1)} f(x)$ does not exist, then what is the value of k?

$x = 2$

$-k + 1 = 2$

$-k = 1$

$k = -1$