AP Calculus AB – Worksheet 8 **Failing Limits; Properties of Limits**

Let b and c be real numbers, let n be a positive integer, and let f and g be functions with the following limits:

$$\lim_{x\to c} f(x) = L \quad \text{and} \quad \lim_{x\to c} g(x) = M.$$

- $\lim_{x\to c} k = k$
- $\lim_{x\to c} x = c$
- $\lim_{x\to c}\left[f(x)\pm g(x)\right] = \lim_{x\to c} f(x) \pm \lim_{x\to c} g(x) = L \pm M$
- $\lim_{x\to c}\left[f(x)\cdot g(x)\right] = \lim_{x\to c} f(x)\cdot\lim_{x\to c} g(x) = L\cdot M$
- $\lim_{x\to c}\dfrac{f(x)}{g(x)} = \dfrac{\lim_{x\to c} f(x)}{\lim_{x\to c} g(x)} = \dfrac{L}{M};\ M\neq 0$
- $\lim_{x\to c}\left[bf(x)\right] = bL$
- $\lim_{x\to 0}\sqrt[n]{f(x)} = \sqrt[n]{L}$
- $\lim_{x\to 0}\left[f(x)\right]^n = L^n$

1) Suppose $\lim_{x\to c} f(x) = 5$, $\lim_{x\to c} g(x) = -2$, and $\lim_{x\to c} h(x) = 9$, find

a) $\lim_{x\to c}\left[f(x)g(x)\right]$

b) $\lim_{x\to c}\left[f(x)-g(x)\right]$

c) $\lim_{x\to c}\sqrt{h(x)}$

d) $\lim_{x\to c}\left[\dfrac{g(x)+1}{x}\right]$

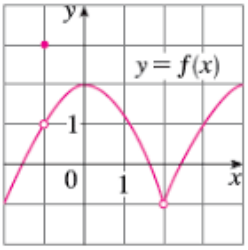
e) $\lim_{x\to c}\left[2h(x)-3g(x)\right]$

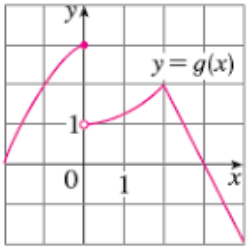
f) $\lim_{x\to c}\left[\dfrac{f(x)}{h(x)}\right]$

g) $\lim_{x\to c}\left[\dfrac{g(x)}{f(x)}\right]$

h) $\lim_{x\to c}\left[g(x)\right]^2$

2) The graphs of f and g are given below. Use the graphs to evaluate each limit.





a) $\lim_{x\to -1}\left[f(x)+g(x)\right]$

b) $\lim_{x\to 3} f\left(g(x)\right)$

c) $\lim_{x\to 3}\left[f(x)g(x)\right]$

d) $\lim_{x\to 2}\left[2f(x)+5g(x)\right]$

e) $\lim_{x\to -1}\left[\dfrac{f(x)}{g(x)}\right]$

f) $\lim_{x\to 2}\left[xf(x)\right]$

Answers:

1)

a) -10	b) 7	c) 3	d) $-\frac{1}{c}$
e) 24	f) $\frac{5}{9}$	g) $-\frac{2}{5}$	h) 4

2)

a) 3	b) 2	c) 0
d) 8	e) $\frac{1}{2}$	f) -2