Math 1210 #3
Limit Theorems

Limit Theorems

n is a positive integer.
k is a real number
$f(x)$ & $g(x)$ have limits as $x \to c$

1. $\lim_{x\to c} k = k$
2. $\lim_{x\to c} x = c$
3. $\lim_{x\to c}[kf(x)] = k\lim_{x\to c} f(x)$
4. $\lim_{x\to c}[f(x) \pm g(x)] = \lim_{x\to c} f(x) \pm \lim_{x\to c} g(x)$
5. $\lim_{x\to c}[f(x)g(x)] = \lim_{x\to c} f(x)\lim_{x\to c} g(x)$
6. $\lim_{x\to c} \frac{f(x)}{g(x)} = \frac{\lim_{x\to c} f(x)}{\lim_{x\to c} g(x)}, g(x) \neq 0$
7. $\lim_{x\to c}[f(x)]^n = [\lim_{x\to c} f(x)]^n$
8. $\lim_{x\to c} \sqrt[n]{f(x)} = \sqrt[n]{\lim_{x\to c} f(x)}$, if $\lim_{x\to c} f(x) > 0$ when n is even.

EX 1

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

EX 2

$lim_{x\to -3}\dfrac{\sqrt{x^2-1}}{2x}$

EX 3

If $\lim_{x\to a} f(x) = 3$ and $\lim_{x\to a} g(x) = -1$, find $\lim_{x\to a}\frac{2f(x)-3g(x)}{f(x)+g(x)}$

Substitution Theorem

If $f(x)$ is a polynomial or a rational function, then $\lim_{x\to c} f(x) = f(c)$ assuming $f(c)$ is defined.

EX 4

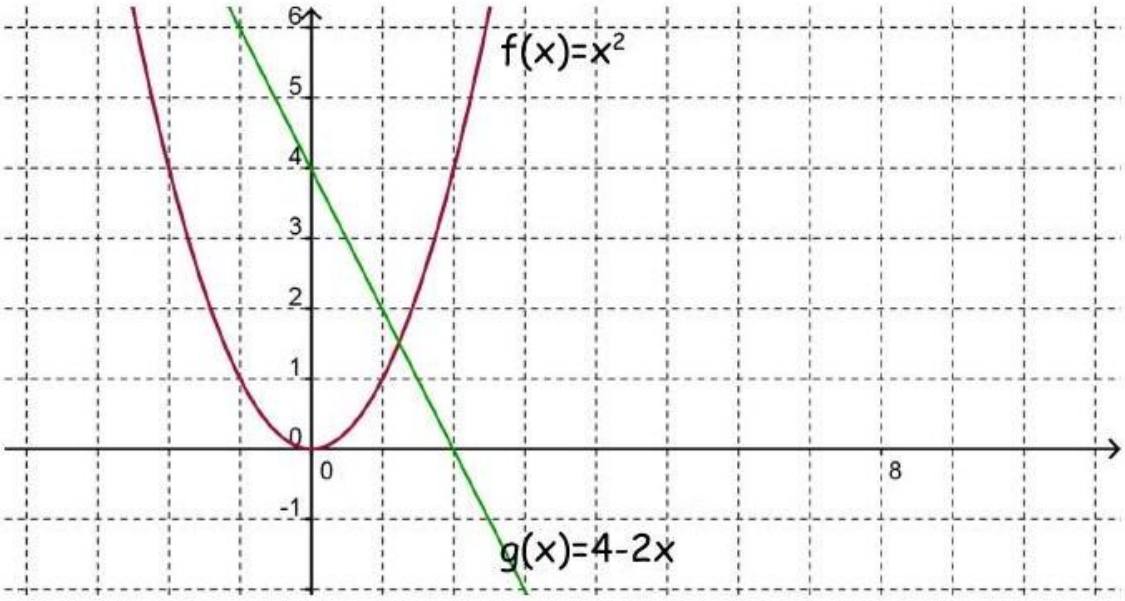
$lim_{x\to -1} \dfrac{3x^2 - 4x^3 + 7x - 5}{2x^2 + 3x + 4}$

EX 5

$lim_{x\to 2} \dfrac{3x^3 + 4x + 1}{x^2 - x - 2}$

EX 6

$lim_{x\to 0} \frac{\sqrt{x+1}-1}{x}$ Hint: rationalize the numerator.



$\lim_{x\to 1} f(x) =$
$\lim_{x\to 1} g(x) =$
$\lim_{x\to 1} f(x) - g(x) =?$