Colby

Math 121C1/E: Fall 2018
Midterm 1 Review Problems

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Some Review Problems

Determine the derivative $f'(x)$.

1. $f(x) = x^2 \sin(x)$

2. $f(x) = \dfrac{1}{\sqrt{x}} - \dfrac{1}{\sqrt[5]{x^3}}$

3. $f(x) = \dfrac{\tan(x)}{1+\cos(x)}$

4. $f(x) = \dfrac{x^4-1}{x^4+1}$

5. $f(x) = \dfrac{1}{1-x^{-1}}$

6. $f(x) = 2x\cos(x)\sin(x)$

Determine $f'(x)$ using the limit defintion.

1. $f(x) = x^2 + 5x$

2. $f(x) = \sqrt{3-5x}$

Find a function $f(x)$ and a real number a so that

1. $\lim\limits_{h\to 0} \dfrac{(2+h)^6 - 64}{h} = f'(a)$

2. $\lim\limits_{h\to 0} \dfrac{\sqrt{(1+h)^3} - 1}{h} = f'(a)$

Compute the limit using Limit Laws or otherwise. You may need to perform some algebra to simplify the expression

1. $\lim\limits_{x\to 3} \dfrac{x^2-9}{x^2+2x-3}$

2. $\lim\limits_{x\to 1} \dfrac{x^2+9}{x^2+2x+3}$

3. $\lim\limits_{x\to 4^+} \dfrac{|x-4|}{x-4}$

Limit Laws: Let $f(x)$, $g(x)$ be functions. Assume that $\lim_{x\to c} f(x)$ and $\lim_{x\to c} g(x)$ both exist.

(LL1) $\lim_{x\to c} bf(x) = b\left(\lim_{x\to c} f(x)\right)$, for any constant b.

(LL2) $\lim_{x\to c} f(x) \pm g(x) = \lim_{x\to c} f(x) \pm \lim_{x\to c} g(x)$

(LL3) $\lim_{x\to c} f(x)g(x) = \left(\lim_{x\to c} f(x)\right)\left(\lim_{x\to c} g(x)\right)$

(LL4) $\lim_{x\to c} \dfrac{f(x)}{g(x)} = \dfrac{\lim_{x\to c} f(x)}{\lim_{x\to c} g(x)}$, provided $\lim_{x\to c} g(x) \neq 0$.

(LL5) For any constant k, $\lim_{x\to c} k = k$.

(LL6) $\lim_{x\to c} x = c$.