Math 199 CD2: Midterm 2 Review

September 29, 2021

1 Complicated and nested derivative

1. Calculate the following derivative and dedicate whether the function is increasing to decreasing at $x = 1$:

   (a) $\frac{d}{dx}\left[\sin(9x)(x^2+5)\right]$

   (b) $\frac{d}{dx}\left[\cos(4x)(\sqrt[4]{x^3+4})\right]$

   (c) $\frac{d}{dx}\left[\arctan(x^6)(x^4+9)^5)\right]$

2 Computing explicit value of derivative

1. Given $f(x) = 4g(x)^2(x^2+1)^4$ and that $g(15) = 10$, $g'(15) = 3$, what is $f'(15)$

2. Given $f(x) = 4\sin(g(x))(x^2+1)^4$ and that $g(15) = \pi$, $g'(15) = 1$, what is $f'(15)$

3 Limit

1. State the limit definition of derivative

2. Compute the following limit:

   (a)
   $$\lim_{h\to 0} \frac{\sqrt{\sin(x+h)+5} - \sqrt{\sin(x)+5}}{h}$$

   (b)
   $$\lim_{h\to 0} \frac{\frac{1}{x+6+h} - \frac{1}{6+x}}{h}$$