

# Calculus I- Midterm 2

Schneider– show work

April 19, 2016

For the first 6 questions find the derivative where your formulas tell you they exist. You do not have to specify the  $x$  where the derivative does not exist.

1. (6 points) Compute the derivative  $\frac{dy}{dx}$  for  $y = 5\tan(x) - 2x^{-1} + \pi^{-1}$ .
2. (6 points) Compute the derivative  $h'(z)$  of the function  $h(z) = 6(\frac{1}{z^2} + 2)\cos(z)$  for  $z > 0$ .
3. (6 points) Compute the derivative  $f'(x)$  of the function  $f(x) = \frac{\cos(x)}{\sqrt{x+2}}$  for  $x > -2$ .
4. (6 points) Compute the derivative  $f'(x)$  of the function  $f(x) = e^{x^3+1}$ .
5. (6 points) Determine the slope of the tangent line to the graph of  $y = \cos(x)\tan(x)$  at  $(0, 0)$ .
6. (6 points) Find the limit or indicate the limit does not exist of:

$$\lim_{x \rightarrow \infty} 1 + xe^{-\frac{x}{10}}$$

7. (6 points) Let  $f(x) = 1/(x-3)^2$ . What is the

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

8. (6 points) Write down an equation of the tangent line to the graph of  $y = 8 - \cos(x)$  at the point where  $x=0$ .
9. (6 points) If the Volume  $V = \frac{4}{3}\pi r^3$  of an expanding sphere is increasing at the constant rate of  $36\pi$  cubic inches per second, how fast is the radius  $r$  increasing when  $r=3$ .
10. (7 points) Find Where the graph of  $x^3 - 3x^2 + 12$  is concave up or concave down, and find all the inflection points.
11. (7 points) Find and classify all the relative extrema of  $f(x) = \frac{x^4}{4} - 2x^2$ .
12. (7 points) Find the absolute maximum and minimum values of  $f(x) = \frac{x^3}{3} - 2x^2 + 3x$  on the interval  $[2, 4]$ .

13. (6 points) A point is moving along the graph of  $y = 3x^2 + 1$  such that  $\frac{dx}{dt} = 2$ . Find  $\frac{dy}{dt}$  when  $x=2$ .
14. (6 points) Use implicit differentiation to find  $\frac{dy}{dx}$  at the point (1,1) on the graph of  $x^3 + xy - y^2 = 1$ .
15. (7 points) A rectangular poster is to have an area of 150 square inches with a 2 inch margin on the right and left and a 3 inch margin at the top and bottom. How would you find the dimensions of the poster with the largest printed area. Just set up your calculations (a derivative = 0).
16. (6 points) The demand function for a product is modeled by  $P = 100e^{-\frac{x}{100}}$  where  $P$  is the price and  $x$  is the number of units. What number of units  $x$  will yield a maximum revenue given by  $xP$ .