Math 231 Calculus 1 Fall 20 Midterm 2

Solutions Name:

- I will count your best 8 of the following 10 questions.
- You may use a calculator, and a US letter page of notes, but no other resources.

1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
	80	

Midterm 2	
Overall	



(1) Find the derivative of  $f(x) = \frac{\sin(x)}{x^2}$ .

$$f^{*}(x) = \frac{\gamma(2\pi \sin(\pi))}{\gamma(4\pi)}$$

 $\mathbf{2}$ 

(2) You drop your sun tan lotion on the edge of the swimming pool, and it starts to leak in to the pool, forming a semicircular sun tan oil slick. If the area of the sun tan oil slick is growing at a rate of  $15 \text{cm}^2/\text{minute}$ , how fast is the radius growing when the radius is 10cm?

Trdr TT. 10 dr dt 15 =

271

 $\mathbf{3}$ 

 $A = \frac{1}{2}\pi c^2$ 

(3) The graph of the functions f and g are shown below.



(4) Find the derivative of the function  $f(x) = e^{-2x} \sin(2x)$ .

$$f'(x) = -2e^{-2x}sin(2x) + e^{-2x}cos(2x).2$$

(5) Use implicit differentiation to find the tangent line to the curve given by the equation  $x^4 + y^3 = 3xy - 1$  at the point (1, 1).

$$4x^{3} + 3y^{2}y' = 3xy + 3y'$$

$$y' = \frac{3xy - 4x^{3}}{3y^{2} - 3} = -\frac{1}{6} \text{ at } (1,1)$$
= 7 verified tangent line  $x = 1$ 

(6) Find the derivative of the function  $f(x) = \tan^{-1}(5\sqrt{x})$ .







(8) Use linear approximation to estimate  $\sqrt{98}$ . What is the percentage error in your approximation?

$$f(x) = \sqrt{x} = \frac{x'/2}{2\sqrt{2}} \qquad f(100) = 10$$

$$f'(n) = \frac{1}{2}x''\frac{2}{2\sqrt{2}} \qquad f'(100) = \frac{1}{20}$$

$$f(9x) \approx f(100) + f'(100) \cdot (-2)$$

$$= 10 + \frac{1}{20} \cdot -2 = 9.9$$

$$enn = 19.9 - \sqrt{18}$$

$$percentage = \frac{19.9 - \sqrt{18}}{\sqrt{98}} \times 100 \approx 0.0051^{2}$$

<sup>10</sup>  
(9) Find the second derivative of the function 
$$f(x) = \sqrt{4x - 4}$$
 =  $(4x - 4)^{1/2}$   
 $f'(x) = \frac{1}{2}(4x - 4)^{-1/2} \cdot 4$   
 $-\frac{3/2}{4}$   
 $f''(x) = -\frac{1}{4}(4x - 4) \cdot \frac{1}{6}$ 

(10) Find the critical points for the function  $f(x) = x^3 - 75x$  and use the first derivative test to classify them.



$$x = \pm 5$$
  
critical prints.  
- 5 local max

+ 5 ford min