Name: ______________________________

Instructor: __________________________

Math 10550, EXAM II
October 13, 3016

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- No calculators.
- The exam lasts for 1 hr. and 15 min.
- Be sure that your name is on every page in case pages become detached.
- Be sure that you have all 10 pages of the test.

PLEASE MARK YOUR ANSWERS WITH AN X, not a circle!

1.	(a)	(b)	(c)	(d)	(e)
2.	(a)	(b)	(c)	(d)	(e)
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4.	(a)	(b)	(c)	(d)	(e)
5.	(a)	(b)	(c)	(d)	(e)
6.	(a)	(b)	(c)	(d)	(e)
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9.	(a)	(b)	(c)	(d)	(e)
10.	(a)	(b)	(c)	(d)	(e)

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Multiple Choice	______________
11.	______________
12.	______________
13.	______________
Total	______________

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Multiple Choice

1.(6 pts.) Find y', if

$$x^4 + x^3 y + 5xy^2 = 8.$$

(a) $\dfrac{-(4x^3 + 3x^2 y + 5y^2)}{10xy}$

(b) $\dfrac{-(4x^3 + 3x^2 y + 5y^2)}{x^3}$

(c) $\dfrac{-(4x^3 + 3x^2 y)}{x^3 + 10xy}$

(d) The derivative does not exist.

(e) $\dfrac{-(4x^3 + 3x^2 y + 5y^2)}{x^3 + 10xy}$

2.(6 pts.) A particle is moving in a straight line along a horizontal axis with a position function given by

$$s(t) = t^2 - 4t + 4,$$

where distance is measured in feet and time is measured in seconds. What is the distance travelled by the particle in the time period $1 \leq t \leq 4$ seconds?

(a) 0 feet

(b) 5 feet

(c) 8 feet

(d) 2 feet

(e) 3 feet

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3.(6 pts.) A right triangle has base x feet and height y feet. If the base increases at 2 ft/second, and the height increases at 1 ft/second, find the rate of change in the area of the right triangle when $x = 8$ and $y = 5$.

(a) 9 ft^2/second (b) 18 ft^2/second (c) 10.5 ft^2/second

(d) 2 ft^2/second (e) -1 ft^2/second

4.(6 pts.) Suppose f is differentiable and $-2 \le f'(x) \le 1$ for all x and $f(2) = 3$. What are the minimum and maximum possible values for $f(5)$?

(a) $-3 \le f(5) \le 0$ (b) $3 \le f(5) \le 6$ (c) $-3 \le f(5) \le 6$

(d) $-10 \le f(5) \le 10$ (e) $-5 \le f(5) \le 4$

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5.(6 pts.) Use linear approximation of $f(x) = \sqrt[3]{x}$ at $a = -8$ to estimate $\sqrt[3]{-8.12}$.

(a) -2.04 (b) -1.99 (c) -1.8 (d) -2.2 (e) -2.01

6.(6 pts.) Find the linearization of the function $f(x) = \sin^2(x)$ at $a = \frac{\pi}{4}$.

(a) $\frac{x}{2} + \frac{1}{2} - \frac{\pi}{4}$ (b) $x + \frac{1}{2} - \frac{\pi}{4}$ (c) $x + \frac{1}{\sqrt{2}} - \frac{\pi}{4}$

(d) $-\frac{10}{4}x - \frac{1}{4}$ (e) $\frac{1}{2}x + \frac{3}{2}$

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7.(6 pts.) Which of the following gives a complete list of the critical numbers/points of the function

$$f(x) = 3x^{2/3} \cdot (x+1)^3$$

(a) $x = \dfrac{-2}{11},\ -1$ (b) $x = \dfrac{2}{11},\ -1$ (c) $x = 0,\ \dfrac{-2}{11},\ -1$

(d) $x = \dfrac{2}{11},\ 1$ (e) $x = -1, 0$

8.(6 pts.) Let $f(x) = 4x^2 - 4x + 4$. Find the absolute maximum and absolute minimum of f on the interval $[0, 2]$. (That is find the maximum and minimum value of $f(x)$ on the given interval).

(a) Max value = 4, Min value = 3

(b) Max value = 12, Min value = 4

(c) Max value = 12, No Minimum value exists

(d) Max value = 6, Min value = 4

(e) Max value = 12, Min value = 3

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9.(6 pts.) Let

$$f(x) = \frac{x^3}{3} - 2x^2 - 12x + 17.$$

On which of the intervals given below is the graph of f **both** decreasing and concave down (on the entire interval)?

(a) $(2, 6)$ (b) $(-2, 6)$ (c) $(-2, 2)$ (d) $(-\infty, 2)$ (e) $(6, \infty)$

10.(6 pts.) Consider the function $f(x) = x^4 - 8x^3 + 5$. Which of the following statements is true?

(a) f has a local minimum at $x = 6$, no local maximum, and points of inflection at $x = 0$ and 4.

(b) f has a local minimum at $x = 6$, a local maximum at $x = 0$, and points of inflection at $x = 0$ and 4.

(c) f has a local maximum at $x = 0$, no local minimum, and a point of inflection at $x = 4$.

(d) f has local minima at $x = 0$ and 6, no local maximum, and a point of inflection at $x = 4$.

(e) f has a local minimum at $x = 6$, no local maximum, and points of inflection at $x = 0, 4$ and -4.

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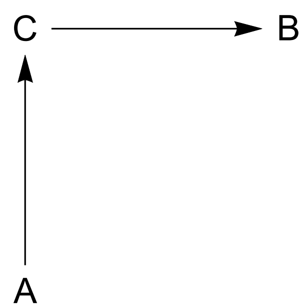
Partial Credit

You must show your work on the partial credit problems to receive credit!

11.(11 pts.) Pedestrian A is walking towards the intersection C of two streets intersecting at a right angle. Pedestrian B is walking away from intersection C. Pedestrian A is going North at 2 mph, and Pedestrian B is going East at 3 mph. How fast is the distance from Pedestrian A to Pedestrian B changing when Pedestrian A is 4 miles South of intersection C, and Pedestrian B is 3 miles East of intersection C.



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12.(13 pts.) Consider the function
$$f(x) = x^3 + x - \frac{1}{x},$$
with domain $(0, \infty)$. With this restriction on the domain, show that the equation $f(x) = 0$ has one and exactly one real solution for $x \in (0, \infty)$. Identify the theorem(s) you are using and show the validity of the required conditions to apply the theorems are true to gain full credit.

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13.(16 pts.) Let $f(x) = x - \sin(2x)$, with domain $(-\frac{\pi}{2}, \frac{\pi}{2})$.

(a) Find the critical numbers/points for f.

(b) Find the intervals where f is increasing and decreasing. (justify your answer)

(c) Classify the critical points as local maxima or local minima or neither and justify your conclusions in each case.

(d) Find the intervals where f is concave up and concave down, and find all inflection points.

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ROUGH WORK

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Total ______________