

MATH 1450 – EXAM 3

Wednesday, November 30

Name: _____

Circle your Tu/Th discussion time: 8am 9am 10am 11am 12pm 1pm

Read ALL instructions carefully.

1. You have 50 minutes to complete this exam.
2. **No calculators**, notes, books, or other resources may be used.
3. Please remove all **headphones** and **smartwatches** and put them away.
4. Please silence your **cell phone** and put it away.
5. Keep your eyes on your own paper, and try not to leave your paper easily visible to others.
6. You must show your work and explain all reasoning unless otherwise stated.
7. If I cannot read your writing, you will not receive credit.
8. **Read the instructions of each section.**

Scores

page 1	/6
page 2	/6
page 3	/6
page 4	/10
page 5	/12
page 6	/10
page 7	/10
Total	/60

The Marquette University honor code obliges students:

- To fully observe the rules governing exams and assignments regarding resource material, electronic aids, copying, collaborating with others, or engaging in any other behavior that subverts the purpose of the exam or assignment and the directions of the instructor.
- To turn in work done specifically for the paper or assignment, and not to borrow work either from other students, or from assignments for other courses.
- To complete individual assignments individually, and neither to accept nor give unauthorized help.
- To report any observed breaches of this honor code and academic honesty.

If you have read the instructions above and you understand and agree to abide by the honor code, sign here:

Section 1: True / False. Choose True or False. If you choose False, explain briefly why the statement is wrong.

1. If f is continuous on the interval $[0, 10]$ and $f(0) = 0$ and $f(10) = 100$, then $f(c)$ cannot be negative for c in $[0, 10]$.

True

False

2. The derivative of $g(x) = (e^x + 2)^5$ is $g'(x) = 5(e^x + 2)^4$.

True

False

3. If $x = p$ is not a critical point of f , then $x = p$ is not a local maximum of f .

True

False

4. If the radius of a circle is increasing at a constant rate, then so is the circumference.

True

False

5. Two horses start a race at the same time and one runs slower than the other throughout the race. The Racetrack Principle can be used to justify the fact that the slower horse loses the race.

True

False

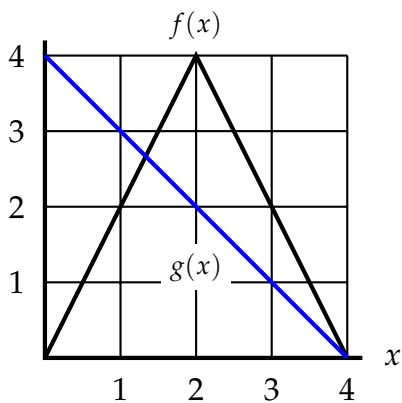
6. If $f'(x) \leq g'(x)$ for all x , then $f(x) \leq g(x)$ for all x .

True

False

Section 2: Free Response. Answer each question. Your must show all work.

7. Let $u(x) = g(f(x))$, where $f(x)$ and $g(x)$ are shown in the figure below. Use the chain rule to estimate each quantity. The graph of $f(x)$ has a sharp corner at $x = 2$. The graph of $g(x)$ is a straight line from $(0,4)$ to $(4,0)$.



(a) $u'(1)$

(b) $u'(2)$

8. Find all critical points and inflection points of $f(x) = 4xe^{3x}$. Show your reasoning.

9. Compute the derivative of $f(x) = 2x \sin(3x)$.

10. The equation $e^x + x = 2$ has a solution near $x = 0$. By replacing the left side of the equation by its linearization, find an approximate value for the solution.

11. Find the critical points of the function $h(x) = x + \frac{1}{x}$ and classify them as local maxima or minima or neither. For any that are local maxima or minima, give the y -values as well.

12. Which point on the curve $y = \sqrt{1-x}$ is closest to the origin?

13. Compute the derivative of $g(x) = \ln(\sin(x) + \cos(x))$.

14. A right triangle has one leg of 7cm. How fast is its area changing at the instant that the other leg has length 10cm and is decreasing at 2cm per second? *Give the units of your answer.* The area of a right triangle is $\frac{1}{2}ab$ where a and b are the lengths of the legs.

15. Compute the derivative of $h(x) = \frac{t+1}{2^t}$