

uid number: _____

Instructor: Kelly MacArthur

Instructions:

- Please show all of your work as partial credit will be given where appropriate, **and** there may be no credit given for problems where there is no work shown.
- All answers should be completely simplified, unless otherwise stated.
- There are no calculators or any sort of electronics allowed on this part of the exam. Make sure all cell phones are put away and out of sight. If you have a cell phone out at any point, for any reason, you will receive a zero on this exam.
- You will be given an opportunity to ask clarifying questions about the instructions at exactly 8:35 a.m. (for a couple minutes). The questions will be answered for the entire class. After that, no further questions will be allowed, for any reason.
- You must show us your U of U student ID card when finished with the exam.
- The exam key will be posted on Canvas by noon.
- You are allowed to use one 4x6 inch note card for your reference during the exam.
- At some point on this test, you will need the code word: mysteriousPi.
- If you use pen, you **MUST** either (a) use an erasable pen and erase work that you don't want graded OR (b) use a white-out tape to get rid of scratch marks and scribbles. If this is not adhered to, we may give you zero points on some or all problems where it's too difficult to grade.

(This exam totals 104 points, with no specified extra credit problem. Your score will be considered as out of 100, which means the extra credit points are built into the test scores.)

This is the no-calculator portion of the exam.

1. Evaluate

(a) (10 points) $\int (2x^4 \sin(x^5 + 3)) dx$

Answer 1(a): _____

(b) (10 points) $\int \left(\frac{2}{t^4} + 3t^4 - 7\cos t - 4\pi^4 \right) dt$

Answer 1(b): _____

2. (10 points) Solve the following differential equation.

$$\frac{dy}{dx} = \frac{3 - \frac{2}{x^3}}{20y^4} \quad \text{such that} \quad y = -1 \quad \text{when} \quad x = 1$$

Answer 2: _____

3. (10 points) Evaluate the definite integral **using the definition** (the tedious way).

$$\int_1^2 (1+3x^2) dx \quad . \quad (\text{Note: Here is the definition.} \quad \int_a^b f(x) dx = \lim_{n \rightarrow \infty} \sum_{i=1}^n f(x_i) \Delta x \quad)$$

$$\Delta x = \underline{\hspace{4cm}}$$

$$x_i = \underline{\hspace{4cm}}$$

$$\sum_{i=1}^n f(x_i) \Delta x =$$

$$\int_1^2 (1+3x^2) dx = \underline{\hspace{4cm}}$$

4. (10 points) For the function $f(x) = \frac{3x+1}{x-3}$ on the closed interval $[4, 8]$, explain whether or not the Mean Value Theorem for Derivatives applies. If it does, find all possible values of c . If not, then state the reason.

MVT applies: True or False (circle one)

Why? _____

If true, then $c =$ _____

(Print code word here.)

5. (10 points) Evaluate.

$$\sum_{i=1}^{30} [(i+1)(2i)]$$

Answer: _____

6. (12 points) A farmer wishes to fence off four identical adjoining rectangular pens, each with 200 square feet of area. Suppose that the outer boundary of the pens requires heavy fence that costs \$10 per foot, but that the three internal partitions require fence costing only \$6 per foot. What dimensions of each pen will produce the least expensive cost for the project?

Answer: _____

7. For $f(x) = \frac{x^2 - 3x - 9}{x + 2}$, answer the following questions.

(a) (4 points) Find the asymptotes, if any exist.

Vertical Asymptote(s): _____

Horizontal/Slant Asymptote(s): _____

(b) (4 points) Fill in the sign line for $f'(x)$ given $f'(x) = \frac{x^2 + 4x + 3}{(x + 2)^2} = \frac{(x + 1)(x + 3)}{(x + 2)^2}$.

$f'(x)$ <----->

(c) (2 points) Find all local min and max **point(s)**, if they exist.

Max point(s): _____

Min point(s): _____

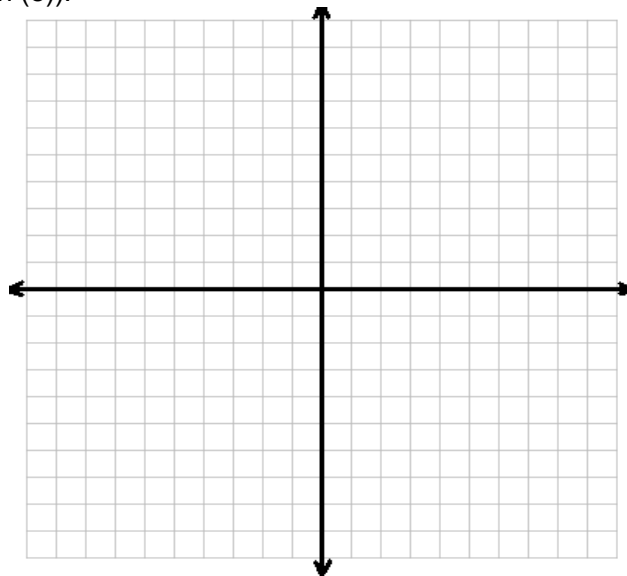
(d) (4 points) Fill in the sign line for $f''(x)$ given $f''(x) = \frac{2}{(x + 2)^3}$.

<-----> $f''(x)$

(e) (2 points) Find all inflection **point(s)**, if any exist.

inflection point(s): _____

(f) (6 points) Sketch the entire graph of the function using **all** this information (from parts (a) through (e)).



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This is the calculator portion of the exam. You are allowed to use a calculator, but not anything connected to the internet.

8. (10 points) Solve $x^3 - 127 = 0$ using Newton's Method, accurate to four decimal places.

Specific formula for $x_{n+1} =$ _____

n	x_n

Answer: _____