

Math 17A
Final Exam

Printed Name _____
(FIRST) (LAST)

Signature _____

ID Number _____

**Please Show All Your Work, and Mark Your Answers Clearly.
No Calculators – No Scratch Paper – No Cell Phones**

There are **9 pages** of problems. (The last 2 problems are for extra credit.)

**You are expected to do your own work, and to adhere
to the UCD Code of Academic Conduct.**

Simplify all numerical answers.

In #17, use interval notation.

Give units for your answers where applicable.

In max-min problems, show whether your answer gives a max. or a min.

Please indicate clearly if you continue work on the back of a page.

Please stop working **immediately** when time is called.

Have a Good Break!

① FIND THE DERIVATIVES OF THE FOLLOWING FUNCTIONS. (DO NOT SIMPLIFY YOUR ANSWERS.)

a) $f(x) = \ln(e^{x^8} + 5^x + 2x)$

8
PTS

b) $f(x) = \left(\sin^4 \frac{x}{5}\right) \left(\tan^7 3x\right)$

10
PTS

② FIND AN EQUATION OF THE TANGENT LINE TO THE GRAPH OF

$f(x) = \frac{x^2 - 1}{4x - 10}$ AT $(3, f(3))$,

8
PTS

③ Use a linearization of $f(x) = \sqrt[3]{x}$ to approximate $\sqrt[3]{67}$.

P.2

7
pts

④ Find the critical numbers and local extrema for $f(x) = 6x^5 - 10x^3$.

9
pts

⑤ Find the absolute extrema for $f(x) = x^{4/3} + x^{1/3}$ on $[-8, 1]$.

9
pts

⑥ IF (a_n) IS DEFINED BY THE RECURSION FORMULA $a_{n+1} = \frac{5}{2} - \frac{1}{a_n}$,
 FIND ALL POSSIBLE VALUES FOR $\lim_{n \rightarrow \infty} a_n$.

6
PTS

⑦ IF THERE ARE 9 FRUITFLIES INITIALLY, AND IF THE NUMBER OF FRUITFLIES DOUBLES EVERY 36 MINUTES, WHEN WILL THERE BE 288 FRUITFLIES? (GIVE UNITS FOR YOUR ANSWER.)

5
PTS

⑧ FIND THE FOLLOWING LIMITS!

a) $\lim_{x \rightarrow 0^+} x^2 \ln x$

6
PTS

b) $\lim_{x \rightarrow \infty} (e^x + 9x)^{1/x}$

9
PTS

9) LET $f(x) = \frac{x^2 + 2x - 6}{x - 3}$.

A) FIND AN EQUATION FOR THE SLANTED ASYMPTOTE TO THE GRAPH OF f .

4
PTS

B) FIND THE LOCAL EXTREMA FOR f .

9
PTS

10) FIND $\frac{dy}{dx}$ FOR THE CURVE $x^5 + 8xy + 3y^2 = e^{4y} + x^3 \ln y$.

14
PTS

11) USE NEWTON'S METHOD WITH $x_1 = 1$ TO FIND A SECOND ESTIMATE x_2 FOR THE SOLUTION TO THE EQUATION $x^3 + 3x = 2 - 5 \ln x$.

7
PTS

(12) SHOW THAT THE EQUATION $x^3 + 3x^2 - 9x = -4$

A) HAS AT LEAST ONE SOLUTION IN $[0, 1]$,

6
PTS

B) DOES NOT HAVE MORE THAN ONE SOLUTION IN $[0, 1]$,

6
PTS

(13) USE THE DEFINITION OF THE DERIVATIVE AS A LIMIT TO FIND $f'(x)$ FOR $f(x) = \sqrt{x^2 + 5x}$.

12
PTS

16) SKETCH THE GRAPH OF A RATIONAL FUNCTION f WITH THE FOLLOWING PROPERTIES:

- A) $x=1$ AND $x=3$ ARE THE ONLY VERTICAL ASYMPTOTES
- B) $y=2$ IS A HORIZONTAL ASYMPTOTE,
- C) $f(-1)=0$ AND $f(4)=-1$ ARE LOCAL MINIMA,
- D) $f(2)=5$ AND $f(-3)=4$ ARE LOCAL MAXIMA,
- E) $(5,1)$ IS A POINT OF INFLECTION,

9
PTS

17) IF $f(x) = 4x - \frac{5}{x^2 + 12}$, DETERMINE WHERE THE GRAPH OF f IS CONCAVE UP OR CONCAVE DOWN,

12
PTS

20) FIND THE SLOPE-INTERCEPT FORM FOR THE LINE WHICH IS TANGENT TO THE CURVE $y = 6\sqrt{x}$ AND WHICH PASSES THROUGH THE POINT $(-4, -5)$.

10

PTS

(EXTRA)

(CREDIT)

21) FIND $\lim_{x \rightarrow \infty} \left(\frac{2^{1/x} + 3^{1/x}}{2 + \frac{1}{x}} \right)^x$

10

PTS

(EXTRA)

(CREDIT)