

Name: _____

Instructor: _____

Math 10550, Practice Exam III
April 8, 2026

- The Honor Code is in effect for this examination. All work is to be your own.
- No calculators.
- The exam lasts for 1 hour and 15 min.
- Be sure that your name is on every page in case pages become detached.
- Be sure that you have all 13 pages of the test.
- Each multiple choice question is worth 7 points. Your score will be the sum of the best 10 scores on the multiple choice questions plus your score on questions 13-15.

PLEASE MARK YOUR ANSWERS WITH AN X, not a circle!					
1.	(a)	(b)	(c)	(d)	(e)
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11.	(a)	(b)	(c)	(d)	(e)
12.	(a)	(b)	(c)	(d)	(e)

Please do NOT write in this box.

Multiple Choice _____

13. _____

14. _____

15. _____

Total _____

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Multiple Choice

1.(7 pts.) How many inflection points does the curve $y = \frac{x^4}{12} - \frac{x^3}{3}$ have?

- (a) 2 (b) 0 (c) 3 (d) 4 (e) 1

2.(7 pts.) A bug being chased by a kitten (both moving in a straight line) enters a kitchen with velocity 1 ft/sec, and accelerates at $\frac{2}{\sqrt{t}}$ ft/sec². How fast is the bug moving 9 seconds later.

- (a) 5 ft/sec (b) 7 ft/sec (c) 13 ft/sec
(d) 4 ft/sec (e) 37 ft/sec

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3.(7 pts.) Suppose f is differentiable and $-2 \leq f'(x) \leq 1$ for all x and $f(2) = 3$. What are the minimum and maximum possible values for $f(5)$?

- (a) $-3 \leq f(5) \leq 0$ (b) $-5 \leq f(5) \leq 4$ (c) $3 \leq f(5) \leq 6$
(d) $-10 \leq f(5) \leq 10$ (e) $-3 \leq f(5) \leq 6$

4.(7 pts.) Use linear approximation of $f(x) = \sqrt[3]{x}$ at $a = -8$ to estimate $\sqrt[3]{-8.12}$.

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

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5.(7 pts.) Find the linearization of the function $f(x) = \sin^2(x)$ at $a = \frac{\pi}{4}$.

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

(b) $-\frac{10}{4}x - \frac{1}{4}$

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

(d) $\frac{1}{2}x + \frac{3}{2}$

(e) $\frac{x}{2} + \frac{1}{2} - \frac{\pi}{4}$

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

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

(a) $x = \frac{2}{11}, -1$

(b) $x = \frac{-2}{11}, -1$

(c) $x = \frac{2}{11}, 1$

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

(e) $x = -1, 0$

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7.(7 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 = 12, Min value = 4
- (b) Max value = 4, Min value = 3
- (c) Max value = 6, Min value = 4
- (d) Max value = 12, No Minimum value exists
- (e) Max value = 12, Min value = 3

8.(7 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) $(6, \infty)$ (b) $(-2, 2)$ (c) $(-\infty, 2)$ (d) $(2, 6)$ (e) $(-2, 6)$

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9.(7 pts.) Consider the function $f(x) = x^4 - 8x^3 + 5$. Which of the following statements is true?

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

10.(7 pts.) $\lim_{x \rightarrow 0^+} (\cos x)^{\frac{1}{x^2}} =$

- (a) ∞
- (b) e
- (c) 1
- (d) $e^{-\frac{1}{2}}$
- (e) Does not exist

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11.(7 pts.) Calculate the following indefinite integral $\int \frac{1+x}{\sqrt{x}} dx$ (i.e. find the general antiderivative for the function $f(x) = \frac{1+x}{\sqrt{x}}$).

(a) $\frac{\sqrt{x}}{2} + \frac{3x^{3/2}}{2} + C$

(b) $\sqrt{x} + x^{3/2} + C$

(c) $2\sqrt{x} + \frac{2x^{3/2}}{3} + C$

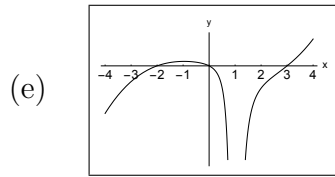
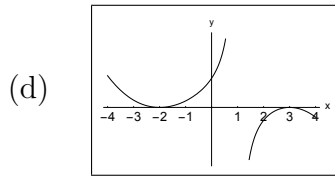
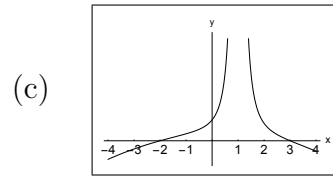
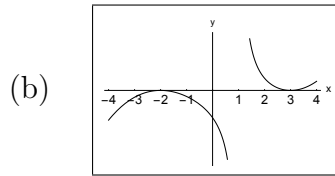
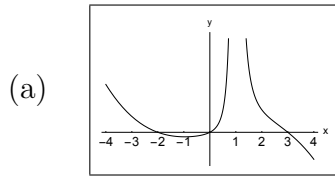
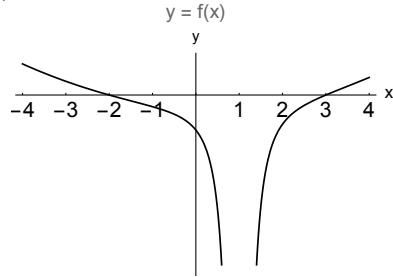
(d) $\frac{-1}{2x^{3/2}} - \frac{1}{\sqrt{x}} + C$

(e) $\frac{-1}{2x^{3/2}} + \frac{1}{\sqrt{x}} + C$

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12.(7 pts.) The graph of $f'(x)$ is shown below:



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Partial Credit

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

13.(12 pts.) A page of a book is to have a total area of 150 square inches, with 1 inch margins at the top and sides, and a 2 inch margin at the bottom. Find the dimensions in inches of the page which will have the largest print area.

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14.(12 pts.) Consider the function

$$f(x) = 2x + \sin(x) + x^3 + 2$$

Show that $f(x)$ has *exactly one* root (i.e. exactly one solution to the equation $f(x) = 0$).

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15. (4 pts.) Please circle “TRUE” if you think the statement is true, and circle “FALSE” if you think the statement is False.

(a)(1 pt. No Partial credit) By the Intermediate Value Theorem, the function $f(x) = \frac{1}{\sin(x)}$ must have an absolute maximum on the interval $-1 \leq x \leq 1$.

TRUE FALSE

(b)(1 pt. No Partial credit) If c is a critical value for $f(x)$ with $f'(c) = 0$ and $f''(c) > 0$, then $f(x)$ must have a local minimum at $x = c$.

TRUE FALSE

(c)(1 pt. No Partial credit) The general antiderivative of $f(x) = \ln(x)$ is $\frac{1}{x} + C..$

TRUE FALSE

(d)(1 pt. No Partial credit) If $f''(x) > 0$ on the interval $-1 \leq x \leq 1$, then using linear approximation at $x = 0$ to estimate $f(0.1)$ gives an underestimate of the value of $f(0.1)$.

TRUE FALSE

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The following is the list of useful trigonometric formulas:

Note: $\sin^{-1} x$ and $\arcsin(x)$ are different names for the same function and $\tan^{-1} x$ and $\arctan(x)$ are different names for the same function.

$$\sin^2 x + \cos^2 x = 1$$

$$1 + \tan^2 x = \sec^2 x$$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\csc \theta = \frac{1}{\sin \theta}$$

$$\cot \theta = \frac{1}{\tan \theta}$$

$$\frac{d}{dx} \tan^{-1} x = \frac{1}{1 + x^2}$$

$$\frac{d}{dx} \sin^{-1} x = \frac{1}{\sqrt{1 - x^2}}$$

$$\frac{d}{dx} \cos^{-1} x = \frac{-1}{\sqrt{1 - x^2}}$$

$$a^x = e^{x \ln(a)}$$

$$\log_a(x) = \frac{\ln(x)}{\ln(a)}$$

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Rough Work

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