Name: **Version #1**

Instructor and class time: _____

Math 10550, Final
Apr. 29, 2026

- The Honor Code is in effect for this examination. All work is to be your own.
- Please turn off all cellphones and electronic devices.
- Calculators are **not** allowed.
- The exam lasts for 2 hours.
- Be sure that your name and instructor's name are on the front page of your exam.
- Be sure that you have all 17 pages of the test.
- There are 26 questions, each question is worth 5 points.
- Your score will be the sum of the best 24 scores.

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

1.	(•)	(b)	(c)	(d)	(e)
2.	(a)	(b)	(c)	(d)	(•)
3.	(a)	(b)	(•)	(d)	(e)
4.	(a)	(b)	(c)	(•)	(e)
5.	(a)	(•)	(c)	(d)	(e)
6.	(a)	(b)	(•)	(d)	(e)
7.	(a)	(•)	(c)	(d)	(e)
8.	(•)	(b)	(c)	(d)	(e)
9.	(•)	(b)	(c)	(d)	(e)
10.	(a)	(b)	(•)	(d)	(e)
11.	(•)	(b)	(c)	(d)	(e)
12.	(a)	(b)	(•)	(d)	(e)
13.	(a)	(b)	(c)	(•)	(e)
14.	(a)	(•)	(c)	(d)	(e)
15.	(a)	(b)	(•)	(d)	(e)
16.	(a)	(b)	(c)	(d)	(•)
17.	(a)	(b)	(•)	(d)	(e)
18.	(a)	(•)	(c)	(d)	(e)
19.	(a)	(b)	(•)	(d)	(e)
20.	(•)	(b)	(c)	(d)	(e)
21.	(a)	(b)	(c)	(•)	(e)
22.	(a)	(b)	(c)	(•)	(e)
23.	(•)	(b)	(c)	(d)	(e)
24.	(a)	(b)	(c)	(d)	(•)
25.	(a)	(b)	(•)	(d)	(e)
26.	(a)	(b)	(c)	(•)	(e)

Please do NOT write in this box.

Total _____

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1.	(a)	(b)	(c)	(d)	(e)
2.	(a)	(b)	(c)	(d)	(e)
			2		
3.	(a)	(b)	(c)	(d)	(e)
4.	(a)	(b)	(c)	(d)	(e)
			3		
5.	(a)	(b)	(c)	(d)	(e)
6.	(a)	(b)	(c)	(d)	(e)
			4		
7.	(a)	(b)	(c)	(d)	(e)
8.	(a)	(b)	(c)	(d)	(e)
			5		
9.	(a)	(b)	(c)	(d)	(e)
10.	(a)	(b)	(c)	(d)	(e)
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11.	(a)	(b)	(c)	(d)	(e)
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13.	(a)	(b)	(c)	(d)	(e)
14.	(a)	(b)	(c)	(d)	(e)
			8		
15.	(a)	(b)	(c)	(d)	(e)
16.	(a)	(b)	(c)	(d)	(e)
			9		
17.	(a)	(b)	(c)	(d)	(e)
18.	(a)	(b)	(c)	(d)	(e)
			10		
19.	(a)	(b)	(c)	(d)	(e)
20.	(a)	(b)	(c)	(d)	(e)
			11		
21.	(a)	(b)	(c)	(d)	(e)
22.	(a)	(b)	(c)	(d)	(e)
			12		
23.	(a)	(b)	(c)	(d)	(e)
24.	(a)	(b)	(c)	(d)	(e)
			13		
25.	(a)	(b)	(c)	(d)	(e)
26.	(a)	(b)	(c)	(d)	(e)
			14		

Please do NOT write in this box.

Total _____

 Initials: _____

1.(5pts) If $f(x) = \int_0^{5x} \cos(u^2)du$, find $f'(x)$

(a) $5\cos(25x^2)$ (b) $-5\cos(25x^2)$ (c) $-25\cos(5x^2)$ (d) $5\cos(5x^2)$ (e) $-\cos(5x^2)$

2.(5pts) Find all local maxima and minima of the function $f(x) = 2|x| - x^2 - 1$.

(a) Only local minimum at $(x, y) = (0, -1)$, no local maxima.

(b) Local maximum: $(x, y) = (-1, 0)$, local minimum $(x, y) = (0, -1)$.

(c) Local maxima: $(x, y) = (-1, 0)$ and $(x, y) = (1, 0)$, no local minimum.

(d) No local maxima or minima, because the function $|x|$ has no derivative at $x = 0$.

(e) Local maxima: $(x, y) = (-1, 0)$ and $(x, y) = (1, 0)$, local minimum $(x, y) = (0, -1)$.

 Initials: _____

3.(5pts) Find $f'(x)$ for

$$f(x) = \ln(2^x + x) + \arcsin(e^x)$$

(a) $\dfrac{e^x \ln 2 + 1}{2^x + x} + \dfrac{e^x}{\sqrt{e^{2x} - 1}}$

(b) $\dfrac{2^x + 1}{2^x + x} + \dfrac{1}{\sqrt{1 - e^{2x}}}$

(c) $\dfrac{2^x \ln 2 + 1}{2^x + x} + \dfrac{e^x}{\sqrt{1 - e^{2x}}}$

(d) $\dfrac{2^x \ln 2}{2^x + x} + \dfrac{e^x}{1 + e^{2x}}$

(e) $\dfrac{e^x \ln 2}{2^x + x} + \dfrac{e^x}{\sqrt{1 - 2e^x}}$

4.(5pts) Compute $\lim\limits_{x \to 0^+} \dfrac{x^2 - 9}{\sin x}$.

(a) $+\infty$

(b) -9

(c) 0

(d) $-\infty$

(e) Does not exist and is not $+\infty$ or $-\infty$.

 Initials: _____

5.(5pts) Let $F(x) = f(g(x))$. Compute $F'(2)$ using the following information:

$f(-1) = -3$, $f(2) = 12$, $g(-1) = -7$, $g(2) = -1$,

$f'(-1) = 2$, $f'(2) = 8$, $g'(-1) = -1$, $g'(2) = 5.$,

(a) 2 (b) 10 (c) 52 (d) -15 (e) 40

6.(5pts) Evaluate $\lim_{x \to +\infty} (\sqrt{x^2 - x} - \sqrt{x^2 + 5x}\,)$.

(a) Does not exist

(b) 0

(c) -3

(d) -6

(e) 3

 Initials: _____

7.(5pts) 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.

(a) $5\sqrt{3} \times \frac{30}{\sqrt{3}}$ (b) 10×15 (c) $3\sqrt{7} \times \frac{50}{\sqrt{7}}$ (d) $11\frac{7}{13} \times 13$ (e) 5×30

8.(5pts) Compute the tangent line to the ellipse given by the equation $x^2 + 4y^2 = 5$ at the point $(1, -1)$

(a) $y = \frac{1}{4}x - \frac{5}{4}$

(b) $y = -\frac{1}{4}x - \frac{3}{4}$

(c) The tangent line does not exist.

(d) $y = \frac{1}{4}x - \frac{3}{4}$

(e) $y = \frac{1}{2}x - \frac{3}{2}$

 Initials: _____

9.(5pts) A kite 100 ft above the ground is flying horizontally (away from its holder) with a speed of 16ft/sec. At what rate is the angle between the string and the horizontal direction changing, when 200 ft of the string have been let out?

(a) $-\frac{1}{25}$ radian/second

(b) $\frac{1}{25}$ radian/second

(c) $\frac{1}{50}$ radian/second

(d) $-\frac{1}{50}$ radian/second

(e) $\frac{\pi}{50}$ radian/second

10.(5pts) Let $f(x) = \begin{cases} ax+1 & x<0, \\ x^2+1 & x \geq 0. \end{cases}$
For what constant a is f differentiable everywhere?

(a) No value of a

(b) $a = 1$

(c) $a = 0$

(d) $a = 2$

(e) Any value of a

7. Initials: _____

11.(5pts) Compute $\lim_{x\to 2^-} \dfrac{x^2-4}{x^2-5x+6}$.

(a) -4 (b) $-\infty$ (c) 1 (d) $+\infty$ (e) 0

12.(5pts) For $y = (\sin 4x)^8$, compute y'.

(a) $32(\cos 4x)^7$

(b) $32(\sin 4x)^7$

(c) $32(\sin 4x)^7 \cos 4x$

(d) $8(\cos 4x)^7$

(e) $8(\sin 4x)^7$

 Initials: _____

13.(5pts) Evaluate the integral $\int_0^{\sqrt{\pi}} x\sin(x^2)dx$.

(a) $\frac{\pi}{4}$ (b) 2 (c) $1-\frac{1}{\pi}$ (d) 1 (e) $\frac{1}{4}$

14.(5pts) Which of the following integrals give the area of the region below the curve $y = 2x$ and above the curve $y = x^2 - 4x$?

(a) $\int_0^4 \Big((x^2-4x)-2x\Big)dx$

(b) $\int_0^6 \Big(2x-(x^2-4x)\Big)dx$

(c) $\int_0^4 \Big(2x-(x^2-4x)\Big)dx$

(d) $\int_0^6 \Big((x^2-4x)-2x\Big)dx$

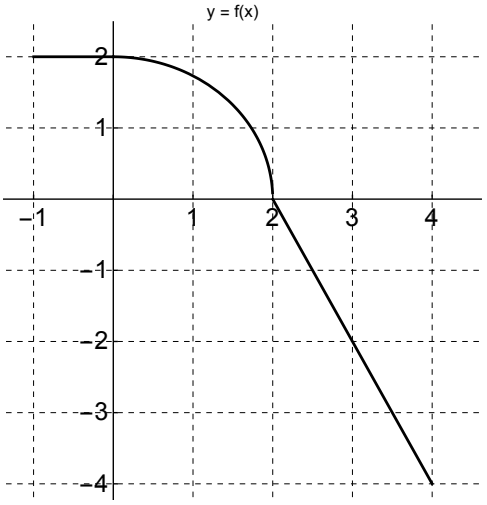
(e) $\int_0^4 \Big(2x-(x^2-4x)\Big)dx + \int_4^6 \Big((x^2-4x)-2x\Big)dx$

9. Initials: _____

15.(5pts) The graph shown below is that of $f(x)$ for $-1 \leq x \leq 4$ where

$$f(x) = \begin{cases} 2 & \text{if} -1 \leq x \leq 0 \\ \sqrt{4-x^2} & \text{if} 0 < x \leq 2 \\ 4-2x & \text{if} 2 \leq x \leq 4 \end{cases}$$

Which of the following equals $\int_{-1}^{4} f(x)dx$?



(a) $2\pi - 2$ (b) $6 + \pi$ (c) $\pi - 2$ (d) π (e) 0

16.(5pts) Find the **left endpoint approximation** to the definite integral

$$\int_{-1}^{3} \frac{6}{2+x} dx$$

using four approximating rectangles of equal base width.

(a) $\frac{71}{5}$ (b) $\frac{71}{10}$ (c) 25 (d) $\frac{131}{10}$ (e) $\frac{25}{2}$

17.(5pts) Compute the derivative y' for the curve $\sqrt{x^2+y^2} = 2+y$ at the point $x=4$, $y=3$

(a) -2 (b) 0 (c) 2 (d) $2/11$ (e) $-2/11$

18.(5pts) Find the derivative of $(x^2+1)^{x^2+1}$.

(a) This function is not defined and hence has no derivative.

(b) $(x^2+1)^{x^2+1}\ 2x\big(\ln(x^2+1)+1\big)$

(c) $2x(x^2+1)^{x^2}$

(d) $(x^2+1)^{x^2+1}$

(e) $(x^2+1)^{x^2+1}\big(2x\ln(x^2+1)\big)$

19.(5pts) Which of the following expressions is equal to $\int_0^2 \sin(x^2)dx$?

(a) $\lim_{n\to\infty} \sum_{i=1}^{n} \frac{1}{n} \sin\left(\frac{4i^2}{n^2}\right)$

(b) $\lim_{n\to\infty} \sum_{i=1}^{n} \frac{1}{n} \sin\left(\frac{i^2}{n^2}\right)$

(c) $\lim_{n\to\infty} \sum_{i=1}^{n} \frac{2}{n} \sin\left(\frac{4i^2}{n^2}\right)$

(d) $-\cos(4) + 1$

(e) $\lim_{n\to\infty} \sum_{i=1}^{n} \frac{2}{n} \sin\left(\frac{2i}{n}\right)$

20.(5pts) If $f(x)$ is a continuous function with

$$\int_{-2}^{-1} f(x)\,dx = 2, \quad \int_{-2}^{2} f(x)\,dx = 1 \text{ and } \int_{2}^{5} f(x)\,dx = 2$$

find $\int_{-1}^{5} f(x)\,dx$.

(a) 1 (b) 3 (c) 2 (d) 0 (e) 6

 Initials: _____

21.(5pts) Compute $\lim_{x\to-\infty} \dfrac{\sqrt{4x^2+x+1}}{3x-1}$.

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

22.(5pts) Evaluate: $\int e^{\cos^2(x)} \sin(x)\cos(x)dx$

(a) $-e^{\cos^2(x)} + C$

(b) $-\dfrac{1}{2}e^{\cos^2(x)}cos(x) + C$

(c) $e^{\cos^2(x)} + C$

(d) $-\dfrac{1}{2}e^{\cos^2(x)} + C$

(e) $-e^{\cos^2(x)} \sin(x)\cos(x) + C$

Initials: _____

23.(5pts) Compute $\lim_{x\to 0} \dfrac{\tan 2x}{\sin 3x}$.

(a) 2/3 (b) 0 (c) 1/3 (d) 1 (e) 2

24.(5pts) How many inflection points does the curve $y = \dfrac{x^5}{5} + \dfrac{x^4}{4}$ have?

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

 Initials: _____

25.(5pts) Find the linearization of $f(x) = \sqrt{10 - x^2}$ at $a = -1$.

(a) $L(x) = -\frac{2}{3}(x + 1) + 3$

(b) $L(x) = -\frac{1}{3}(x + 1) + 3$

(c) $L(x) = \frac{1}{3}(x + 1) + 3$

(d) $L(x) = x + 4$

(e) $L(x) = \frac{2}{3}(x + 1) + 3$

26.(5pts) A particle is moving in a straight line with velocity $v(t) = \frac{4}{3}t^3 - \frac{4}{3}t$ feet per second. Find the <u>distance</u> travelled by the particle on the time interval $0 \leq t \leq 2$.

(a) $\frac{20}{3}$ feet

(b) $\frac{32}{3}$ feet

(c) 3 feet

(d) $\frac{10}{3}$ feet

(e) $\frac{8}{3}$ feet

15. Initials: _____

The following is the list of useful 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.

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

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

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

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

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

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

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

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

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

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

$$\int \ln(x)\,dx = x\ln(x) - x + C$$

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

$$\sum_{i=1}^{n} i^2 = \frac{(2n+1)n(n+1)}{6}$$

$$\sum_{i=1}^{n} i^3 = \left[\frac{n(n+1)}{2}\right]^2$$

16. Initials: _____

Rough Work

17. Initials: _____

Rough Work