

Name: _____

Instructor: _____

Math 10550, Practice Exam III
November 20, 2024

- 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 12 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!					
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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) 1 (b) 3 (c) 2 (d) 4 (e) 0

2.(7 pts.) Evaluate $\lim_{x \rightarrow -\infty} \frac{3x^3 - 2x + 1}{2x^2 + x + 1}$

- (a) 0 (b) $-\frac{3}{2}$ (c) $\frac{3}{2}$
(d) $-\infty$ (e) Does not exist

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3.(7 pts.) The slant asymptote of $y = \frac{2x^4 + x^3 + 5}{x^3 - 3x^2 + 2}$ is given by

- (a) There are no slant asymptotes. (b) $y = 2x + 7$
(c) $y = x + 4$ (d) $y = 2x - 5$
(e) $y = 2x + 4$

4.(7 pts.) Evaluate $\lim_{x \rightarrow -\infty} \frac{\sqrt{4x^6 + 5}}{x^3 + 1}$.

- (a) $3/2$ (b) 6 (c) -2 (d) 2 (e) 4

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5.(7 pts.) If we want to use Newton's method to find an approximate solution to

$$\cos(x) - x = 0$$

with initial approximation $x_1 = \frac{\pi}{2}$, what is x_2 ?

- (a) $\frac{3\pi}{4}$ (b) 0 (c) $\frac{\pi}{2}$ (d) π (e) $\frac{\pi}{4}$

6.(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) 13 ft/sec (b) 7 ft/sec (c) 5 ft/sec
(d) 4 ft/sec (e) 37 ft/sec

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7.(7 pts.) 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) $\frac{71}{10}$ (b) $\frac{131}{10}$ (c) 25 (d) $\frac{71}{5}$ (e) $\frac{25}{2}$

8.(7 pts.) If $f(x)$ is a continuous function with

$$\int_{-2}^{-1} f(x) dx = 2, \quad \int_{-2}^2 f(x) dx = 1 \quad \text{and} \quad \int_2^5 f(x) dx = 2$$

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

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

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9.(7 pts.) Calculate the following definite integral

$$\int_1^3 \frac{\sqrt{x} + x^3}{x^{5/2}} dx.$$

(a) $\frac{3}{2}$

(b) $2\sqrt{3}$

(c) $\frac{5}{2}$

(d) $2\sqrt{3} - \frac{1}{3}$

(e) $2\sqrt{3} + \frac{1}{2}$

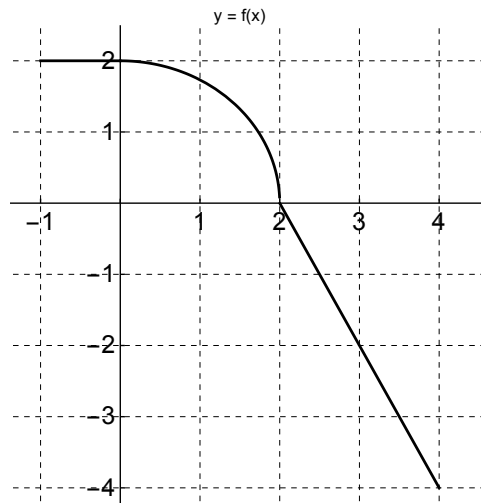
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10.(7 pts.) The graph shown below is that of $f(x)$ for $-1 \leq x \leq 4$ where

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

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



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

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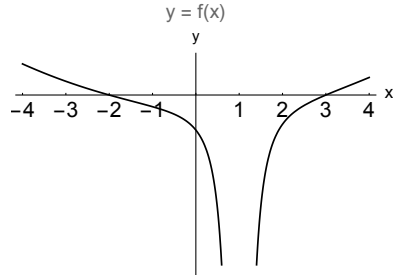
11.(7 pts.) If $f(x) = \int_{x^3}^1 \sqrt{1 + \sin(t)} dt$, then $f'(x) =$

- (a) $\sqrt{1 + \sin(x^3)}$ (b) $\sqrt{1 + \sin(x)}$ (c) $-\sqrt{1 + \sin(x^3)}$
(d) $-3x^2\sqrt{1 + \sin(x^3)}$ (e) $3x^2\sqrt{1 + \sin(x^3)}$

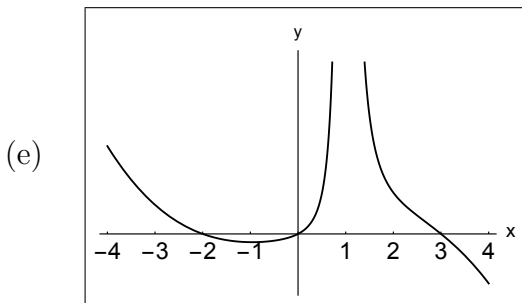
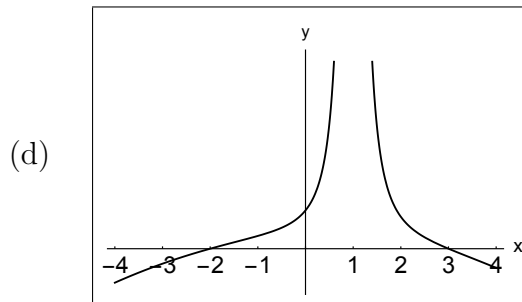
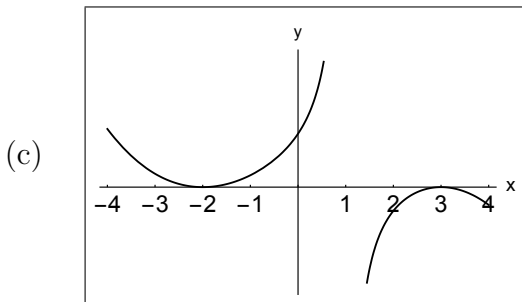
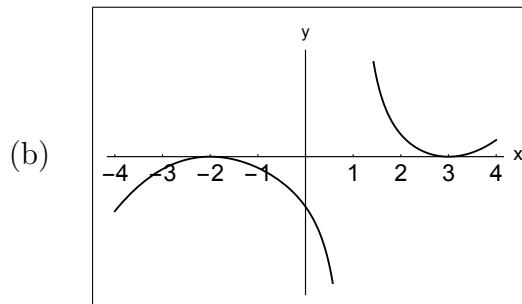
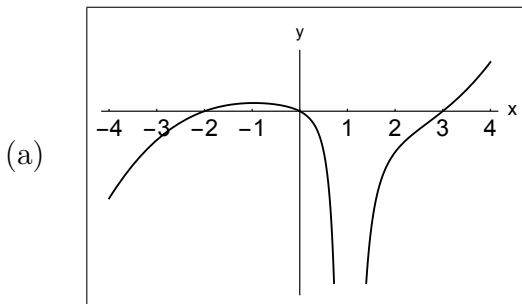
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12.(7 pts.) The graph of $f(x)$ is shown below:



which of the following gives the graph of an antiderivative for the function $f(x)$?



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Partial Credit

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

13.(10 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.(10 pts.) A particle is moving in a straight line with acceleration

$$a(t) = 4 \left(t^2 - \frac{1}{3} \right) \text{ ft/s}^2,$$

where distance is measured in feet and time in seconds. The initial velocity of the particle is $v(0) = 0$ ft/s and the initial position of the particle is $s(0) = 0$.

(a) Find the velocity of the particle at time t (i.e. find $v(t)$).

(b) Find the position of the particle at time t (i.e. find $s(t)$).

(c) Find the values of t for which $v(t) = 0$ on the interval $[0, \infty)$.

(d) Find the distance travelled by the particle on the time interval $0 \leq t \leq 2$.

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15.(10 pts.) Evaluate the definite integral shown below using right endpoint approximations and the limit definition of the definite integral

$$\int_0^2 \frac{x}{2} dx$$

$$\left(\text{Note: } 1 + 2 + 3 + \cdots + n = \sum_{i=1}^n i = \frac{n(n+1)}{2}. \right)$$

Verify your answer using the fundamental theorem of calculus.

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