Name________________________Section____________

1-8	/51	11	/12
9	/10	12	/10
10	/10	13	/12
		Total	/105

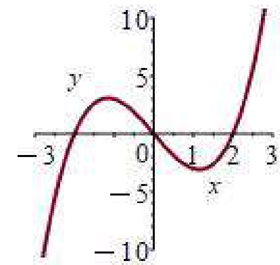
MATH 171 Final Exam B Fall 2022

Section 502/504 P. Yasskin

Multiple Choice and Short Answer: Points indicated.

Show your work in case there is part credit.

1. (16 points) Consider a function, $y = f(x)$.
At the right is the graph of its **second** derivative, $y = f''(x)$.
Give answers to the nearest integer.



a. (4 points) Find the interval(s) where $f(x)$ is concave down.

Intervals:______________________________

b. (4 points) Find the location(s) of the inflection point(s) of $f(x)$.

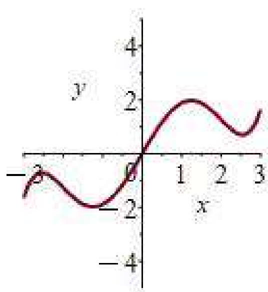
Inflection point(s) at: $x =$______________________________

c. (4 points) Find the interval(s) where the first derivative $f'(x)$ is increasing.

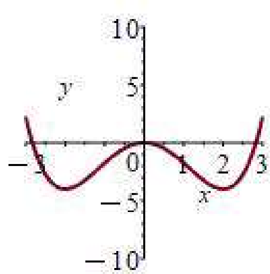
Intervals:______________________________

d. (4 points) Which of these is the graph of $y = f(x)$?

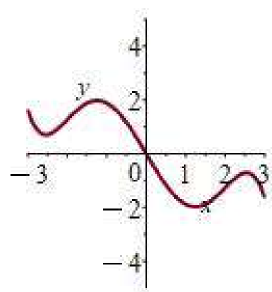
Circle your answer.



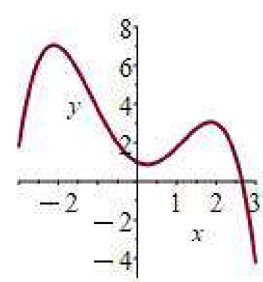
A



B



C



D

2. (5 points) A triangle has vertices $A = (1,3)$, $B = (4,4)$ and $C = (5,1)$. Find the angle at A.

$\theta =$ ______________________________

3. (5 points) The point $x = 1$ is a critical point of the function $f(x) = x^4 - \frac{8}{3}x^3 + 2x^2$. What does the Second Derivative Test say about this point?

a. Local Minimum
b. Local Maximum
c. Inflection Point
d. The test fails

4. (5 points) Find the locations of the global minimum and maximum of the function $f(x) = x^4 - 8x^2$ on the interval $[-1, 3]$.

a. Global Minima at $x =$ ____________________

Global Maxima at $x =$ ____________________

5. (5 points) Find the equation of the line tangent to the curve $x^4y^4 - 16xy = -16$ at $(x, y) = (2, 1)$. Then find its y-intercept.

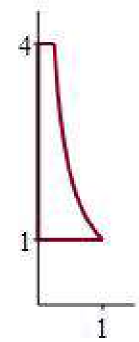
a. Tangent Line: ____________________

y-Intercept $b =$ ____________________

6. (5 points) Find the average value of the function $f(x) = \sec^2 x$ on the interval $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$. Simplify your answer.

a. $f_{\text{ave}} =$ ______________________________

7. (5 points) Find the area between the graph of $x = \frac{1}{y}$ and the y-axis for $1 \le y \le 4$. Simplify your answer.



a. $A =$ ______________________________

8. (5 points) Find the mass and center of mass of a 3 cm bar whose linear mass density is $\delta = 36 - 6x$ where x is measured from one end.

a. Mass $M =$ ______________________________

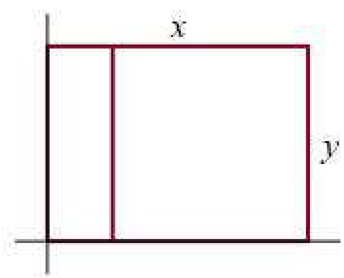
Center of Mass $\bar{x} =$ ______________________________

Work Out: (Points indicated. Part credit possible. Show all work.)

9. (10 points) A ball is thrown up from a height of $y(0) = 64$ ft with an initial velocity of $v(0) = 48 \dfrac{\text{ft}}{\text{sec}}$. When does it hit the ground?

Note the acceleration of gravity is $a = -32 \dfrac{\text{ft}}{\text{sec}^2}$.

10. (10 points) A farmer wants to fence in a grazing field and split it into two pieces for cows and horses. The field will be a rectangle surrounded by fence with a divider fence parallel to one side. What are the length, width and area of the field which maximize the total area, if the total length of fence is 2400 meters?



11. (12 points) Compute the limits:

a. (6 points) $L = \lim_{x \to 2} \left(\frac{1}{x^2 - 2x} - \frac{4}{x^3 - 4x} \right)$

b. (6 points) $L = \lim_{x \to \infty} (1 + x^2)^{2/x^2}$

12. (10 points) If $g(x) = \int_{\ln(2x)}^{\ln(3x)} \frac{1}{1 + e^t} dt$, use Leibniz's method to find $g'(x)$ and $g'(1)$. Simplify exponentials and logs.

13. (12 points) Consider the parametric curve $\vec{r} = (2t^3 - 9t^2 + 12t + 3, t^2 - 4t + 4)$.

a. (6 points) Find the values of t at all horizontal and vertical tangents to the curve.

Horizontal Tangents at $t =$ ______________________________

Vertical Tangents at $t =$ ______________________________

b. (6 points) Find a parametric tangent line to the curve at $t = 0$.