Name_____ Section_____

MATH 171 Exam 3B Fall 2022

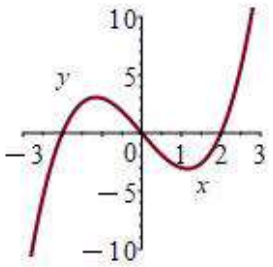
Section 502/504 P. Yasskin

Short Answer: Points indicated.

Show your work in case there is part credit.

1-4	/40	7	/20
5	/10	8	/10
6	/10	9	/15
		Total	/105

1. (20 points) Consider a function, $y = f(x)$.
At the right is the graph of its derivative, $y = f'(x)$.
Give answers to the nearest integer.



a. (5 points) Find the interval(s) where $f(x)$ is increasing.

Intervals:_____

b. (5 points) Find the location(s) of all local maxima of $f(x)$.

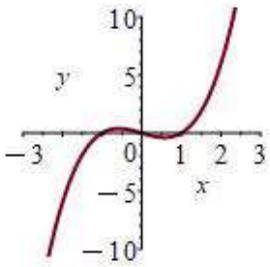
Maxima at: $x =$_____

c. (5 points) Find the interval(s) where $f(x)$ is concave down.

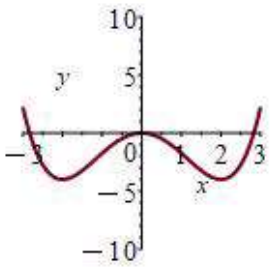
Intervals:_____

d. (5 points) Which of these is the graph of $y = f(x)$?

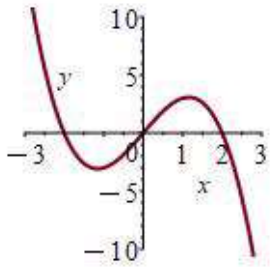
Circle your answer.



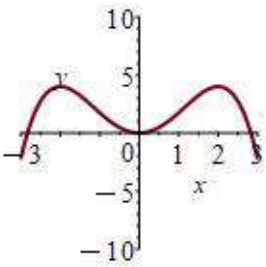
A



B



C



D

2. (9 points) Find the general antiderivative of $p(x) = 12x^3 + \sin x + \frac{x}{1+x^2}$.

$P(x) =$_____

3. (5 points) Find the area under the curve $y = \sec^2 x$ above the interval $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$. (Evaluate all trig functions.)

$A =$_____

4. (6 points) Use a right Riemann sum with 3 equal width intervals to estimate $\int_1^7 \frac{1}{1+x}\,dx$.

$\int_1^7 \frac{1}{1+x}\,dx \approx$_____

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

5. (10 points) A right triangle has sides $a = 5$ cm and $b = 12$ cm and hypotenuse $c = 13$ cm. If b is increasing at $\frac{db}{dt} = 3 \frac{\text{cm}}{\text{sec}}$ while c is increasing at $\frac{dc}{dt} = 2 \frac{\text{cm}}{\text{sec}}$, at what rate is a changing? Is it increasing or decreasing?

$\frac{da}{dt} =$_____ increasing / decreasing

6. (10 points) If $g(x) = \int_{e^{-x}}^{e^x} \frac{1}{1 + \ln t} dt$, find $g'(x)$ and $g'(0)$.

$g'(x) =$ _____ $g'(0) =$_____

7. (20 points) For each limit, identify the indeterminate form and then compute the limit:

a. (10 points) $\lim_{x\to 3} \dfrac{x\ln x - x - x\ln 3 + 3}{(x-3)^2}$

b. (10 points) $\lim_{x\to 0^+} \left(1 + \dfrac{2x}{3}\right)^{8/x}$

8. (10 points) Find the smallest value of $f = 6x + y$ on the curve $x^3 y = 2$ in the first quadrant. How do you know this is the minimum?

9. (15 points) Evaluate each integral.

a. (5 points) $\int \cos x \sin^5 x \, dx$

b. (5 points) $\int_0^1 x^2 e^{6x^3} \, dx$

c. (5 points) $\int x^5 \sqrt{1+x^3} \, dx$