Name_____ Section_____

MATH 171 Exam 3A Fall 2022

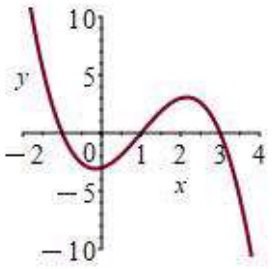
Section 502/504 P. Yasskin

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 decreasing.

Intervals:_____

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

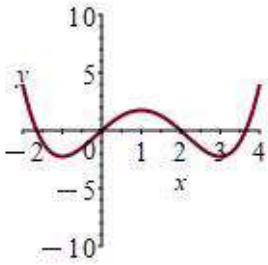
Minima at: $x =$_____

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

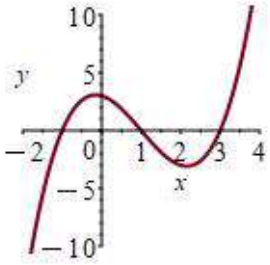
Intervals:_____

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

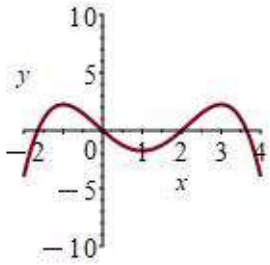
Circle your answer.



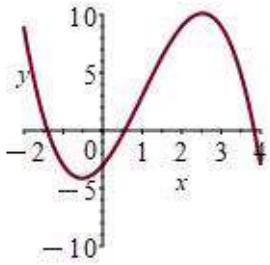
A



B



C



D

2. (9 points) Find the general antiderivative of $p(x) = 6x^2 + \sec^2 x + xe^{x^2}$.

$P(x) =$_____

3. (5 points) Find the area under the curve $y = \dfrac{2x}{1+x^2}$ above the interval $[1,3]$.

$A =$_____

4. (6 points) Use a right Riemann sum with 3 equal width intervals to estimate $\int_3^9 \dfrac{1}{x-1}\,dx$.

$\int_3^9 \dfrac{1}{x-1}\,dx \approx$_____

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

5. (10 points) The volume of a square pyramid is $V = \frac{1}{3}s^2h$ where s is the length of the side of the square base and h is the height. Currently, $s = 40$ cm and $h = 30$ cm. If the volume is held fixed while the height decreases at $\frac{dh}{dt} = -3 \frac{\text{cm}}{\text{sec}}$, how fast is the side, s, changing? Is it increasing or decreasing?

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

6. (10 points) If $g(x) = \int_{\sin x}^{\cos x} \frac{1}{1+t^4}dt$, 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) $\lim_{x\to\pi} \dfrac{x\cos x - \sin x + \pi}{(x-\pi)^2}$

b. (10 points) $\lim_{x\to 0^+} (1-5x)^{3/x}$

8. (10 points) Find the smallest value of $f = 8x + y$ on the curve $x^2y = 4$ in the first quadrant. How do you know this is the minimum?

9. (15 points) Evaluate each integral.

a. (5 points) $\int \frac{(\ln x)^3}{x}\,dx$

b. (5 points) $\int_0^1 x\sin(\pi x^2)\,dx$

c. (5 points) $\int x^3(1+x^2)^{499}\,dx$