

NAME : _____
OSU Name.# : _____
Lecturer: : _____
Recitation Instructor : _____
Recitation Time : _____

INSTRUCTIONS

- **SHOW ALL WORK** in problems 2, 3, 4, and 5 .
Incorrect answers with work shown may receive partial credit,
but unsubstantiated correct answers may receive NO credit.
- You don ' t have to show work in problem 1.
- Give EXACT answers unless asked to do otherwise.
 - You do not need to simplify numerical answers such as $\frac{5}{\sqrt{8}} - \frac{3}{\sqrt{32}}$.
 - Calculators are NOT permitted !
PDA ' s , laptops , and cell phones are prohibited.
Do not have these devices out !
 - The exam duration is 55 minutes .
 - The exam consists of 5 problems starting on page 2 and ending on page 8 .
Make sure your exam is not missing any pages before you start .

PROBLEM NUMBER	SCORE
1	(25)
2	(12)
3	(15)
4	(26)
5	(22)
TOTAL	(100)

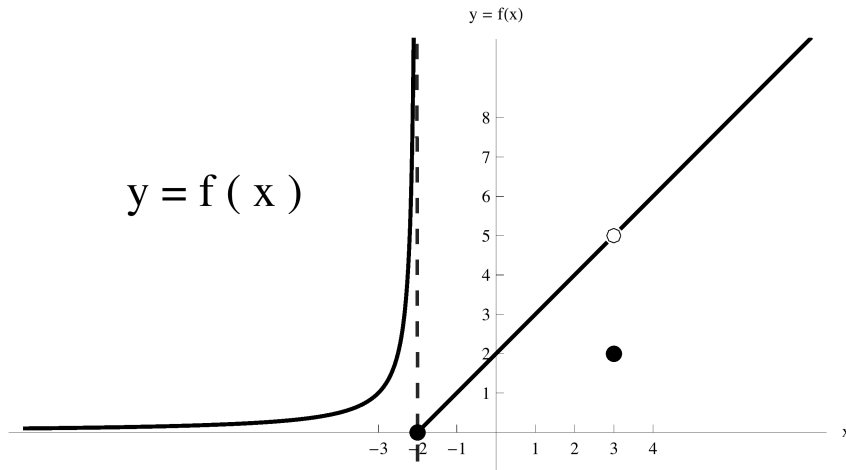
MIDTERM 1
Form A, Page 2

1. (25 pts)

The graph of a function f is given in the figure below.

The domain of f is $(-\infty, +\infty)$.

Use the graph of f to answer the questions below.



(I) (1 pt) Find the range of f .

Range of f =

(II) Find the following values.

(Note: Possible answers include $+\infty$, $-\infty$, or "does not exist".)

(a) (1 pt) $\lim_{x \rightarrow 3^+} f(x) =$

(b) (1 pt) $\lim_{x \rightarrow 3^-} f(x) =$

(c) (1 pt) $\lim_{x \rightarrow 3} f(x) =$

(d) (1 pt) $f(3) =$

MIDTERM 1
Form A, Page 3

1. (CONTINUED)

(e) (2 pts) $\lim_{x \rightarrow -2^-} f(x) =$

(f) (2 pts) $\lim_{x \rightarrow -2^+} f(x) =$

(g) (2 pts) $\lim_{x \rightarrow -2} f(x) =$

(h) (2 pts) $\lim_{x \rightarrow -\infty} f(x) =$

(i) (2 pts) $\lim_{x \rightarrow +\infty} f(x) =$

(III) (2 pts) Find all vertical asymptotes.

(IV) (2 pts) Find all horizontal asymptotes.

(V) (2 pts) Find all slant asymptotes.

(VI) (4 pts) Determine the intervals of continuity for f .

MIDTERM 1
Form A, Page 4

2. (12 pts)

(I) (6 pts)

Use a right triangle to simplify the given expression.
Assume $x > 0$.

$$\tan (\cos^{-1} x)$$

(II) (6 pts)

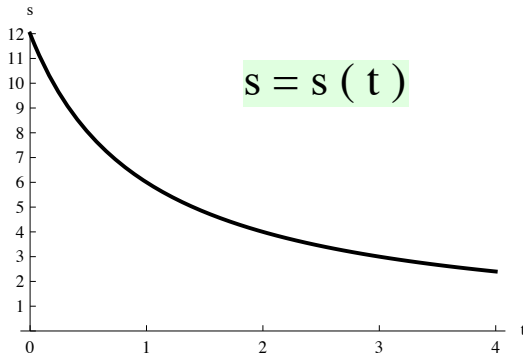
Find the inverse of the given function and write it in the form

$$y = f^{-1}(x).$$

$$f(x) = \sqrt[3]{x - 2}$$

3. (15 pts)

(I) The graph of the function $s(t) = \frac{12}{t+1}$ is given below.



(a) In the figure above draw a secant line joining the points $(0, s(0))$ and $(2, s(2))$.

(b) Find the slope, m_{sec} , of this secant line.

(c) Draw a tangent line to the curve $s = s(t)$ at the point where $t = 2$.

(d) Is the slope of this tangent line, m_{tan} , positive or negative?

(II) Suppose $s(t) = \frac{12}{t+1}$ is the position of an object moving along a line at time $t \geq 0$.

(a) How is the average velocity, v_{av} , between the times $t = 0$ and $t = 2$ related to the slope m_{sec} from the part (I b)?

(b) Is the instantaneous velocity, v_{inst} , at $t = 2$ positive or negative? Explain.

MIDTERM 1

Form A, Page 6

4. (26 pts) Evaluate the limit or say that the limit does not exist .
If a limit does not exist, explain why. Show your work.

You may NOT use a table of values, a graph,
or L' Hospital's Rule to justify your answer.

(Note : Possible answers include $+\infty$ or $-\infty$.)

(a) (10 pts) $\lim_{x \rightarrow 2} \frac{x - 2}{\sqrt{x^2 + 5} - 3} =$

4. (CONTINUED)

(b) (8 pts) $\lim_{x \rightarrow 0^+} \frac{-e^x}{x + 4x^2} =$

(c) (8 pts) $\lim_{x \rightarrow \infty} \frac{\cos x}{x + 4x^2} =$

5. (22 pts)

$$\text{Let } g(x) = \begin{cases} \frac{x^2 - 4}{x - 5} & \text{if } x < 2, \\ \sin(\pi x) & \text{if } x \geq 2. \end{cases}$$

(I) Evaluate the limit or state that it does not exist.

If the limit does not exist, explain why.

Show your work. (Note: Possible answers include $+\infty$ or $-\infty$.)

(a) (3 pts) $\lim_{x \rightarrow -\infty} g(x) =$; (b) (3 pts) $\lim_{x \rightarrow +\infty} g(x) =$

(II) (2 pts) Determine whether g has any horizontal asymptotes. If so, write the equation (or equations) of all horizontal asymptotes.

(III) (4 pts) Determine whether g has any slant asymptotes. If so, write the equation (or equations) of all slant asymptotes.

(IV) (2 pts) Determine whether g has any vertical asymptotes. If so, write the equation (or equations) of all vertical asymptotes.

(V) (8 pts) Determine whether g is continuous at 2.
Use the definition of continuity, when justifying your answer.
SHOW YOUR WORK.