

Name:

ID#:

Rec:

ELC3	Josh	MW 6:50p	R01	Yoav	M 9:35a	R02	Samir	Th 12:50p	R03	Ari	Tu 2:20p	R04	Yuan	Th 5:20p
R05	Daniel	M 11:45a	R06	Samir	Th 2:20p	R07	Wenchuan	Th 5:20p	R08	Amy	F 9:35a	R09	Yuan	Th 2:20p
R10	Yoav	W 9:35a	R11	Daniel	W 11:45a	R12	Dezhen	F 11:45a	R13	Xiaojun	M 5:20p	R15	Amy	W 8:30a
R16	Ari	Th 2:20p	R17	Daniel	M 5:20p	R19	Dezhen	M 11:45a	R20	Wenchuan	Tu 9:50a			

problem	1	2	3	4	5	6	7	Total
possible	10	15	9	20	20	15	11	100
score								

Directions: There are 7 problems on six pages in this exam. Make sure that you have them all. Do all of your work in this exam booklet, and cross out any work that the grader should ignore. You may use the backs of pages, but indicate what is where if you expect someone to look at it. **Books, calculators, extra papers, and discussions with friends are not permitted.** Leave all answers in exact form (that is, do *not* approximate π , square roots, and so on.)

1. (10 points) A function $T(z)$ is given by the following table:

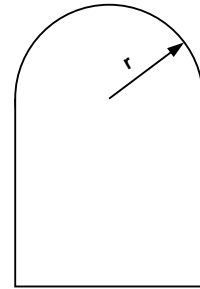
z	0	1	2	3	4
$T(z)$	5	7	3	-1	-4

a. Write the equation of the line that passes through the points on the graph of $T(z)$ with $z = 1$ and $z = 3$.

b. If T is continuous function for $0 \leq z \leq 4$, why can we conclude that $T(z) = 0$ for some value of z between 2 and 3?

2. (15 points) A window has the shape of a half-circle on top of a square. Denote the radius of the circle by r . See the figure at right.

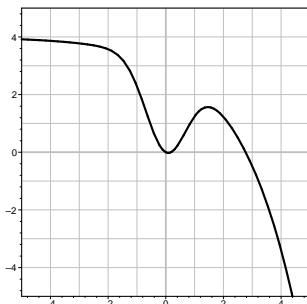
a. Express the perimeter P of the window as a function of r .



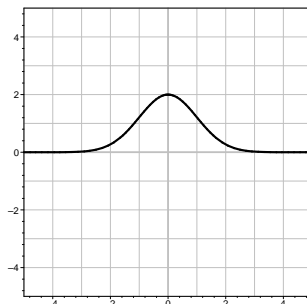
b. Express the area A of the window as a function of r .

c. Express the area A of the window as a function of its perimeter P .

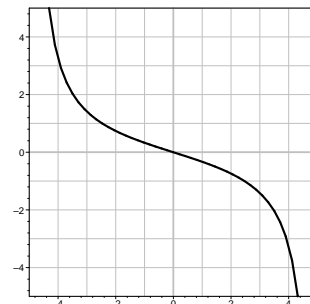
3. (9 points) The graphs of several functions $f(x)$ are shown below. On the same set of axes, sketch the function $g(x)$ as indicated.



$$g(x) = f(|x|)$$

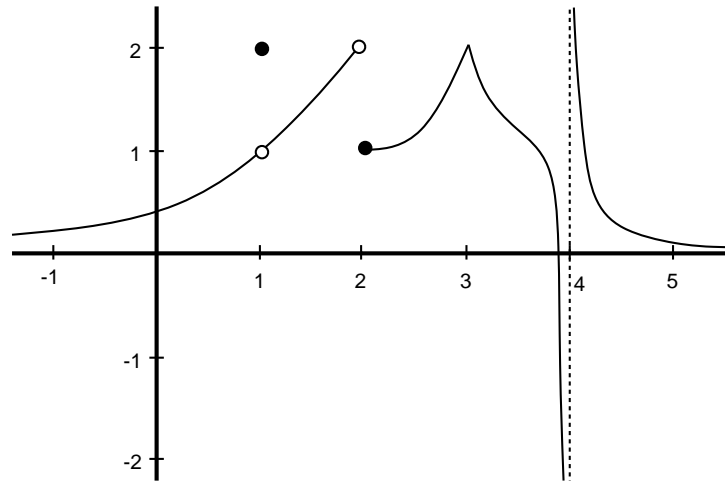


$$g(x) = -f(x/2)$$



$$g(x) = f^{-1}(x)$$

4. (20 points) Let $f(x)$ be the function whose graph is shown below.



a. List all points $-1 \leq x \leq 5$ where $f(x)$ is not continuous. If there are none, write “none”.

b. What is $f(2)$? If it is not defined, write DNE.

c. What is $\lim_{x \rightarrow 2} f(x)$? If it is not defined, write DNE.

d. What is $\lim_{x \rightarrow 1^-} f(x)$? If it is not defined, write DNE.

e. What is $\lim_{x \rightarrow 2} \frac{f(x-1)}{f(x+1)}$? If it is not defined, write DNE.

5. (20 points) Compute each of the limits below. If the limit does not exist, say so. Justify your answer in all cases.

a. $\lim_{x \rightarrow 1} 2 \ln(x)$

b. $\lim_{x \rightarrow 3} \frac{x^2 - x - 6}{x - 3}$

c. $\lim_{x \rightarrow 0^-} \frac{|x|}{x}$

d. $\lim_{x \rightarrow 0} \frac{(x - 3)^2 - 9}{x}$

e. $\lim_{h \rightarrow 0^+} \tan(h) \sin\left(\frac{\pi}{h}\right)$ Hint: recall that $-1 \leq \sin x \leq 1$ for any x .

6. (15 points)

- a. The values of the functions h and g are given by the table at right. What is the value of the function $g \circ h$ at 1?

x	g(x)	h(x)
0	1	2
1	0	1
2	2	0

- b. If $3^{x+2} = 7$, what is x ?

- c. What is the domain of the function $\ln(x^2 - 1)$?

- d. If $\sin(x) = 1/3$ and $\tan(x) < 0$, what is $\cos(x)$?

- e. If the graph of $y = e^{kt}$ passes through the point $(5, 1)$, what is k ?

7. (11 points) Let $g(x) = \frac{5 - 5e^x}{5 + 5e^x}$.

a. Write a formula for $g^{-1}(x)$.

b. What is the domain of $g^{-1}(x)$?