

Test 1

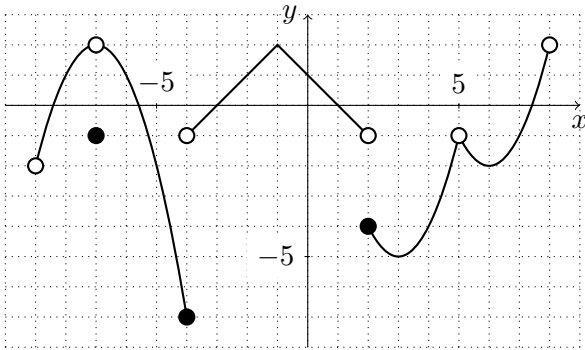
Show all your work

Name: _____

Score: ____/42

No Calculator allowed in this part.

Problem 1: Use the graph of $y = f(x)$ below to answer the questions.



a. Find the domain of f

b. $\lim_{x \rightarrow 5} f(x) =$

c. $\lim_{x \rightarrow 2} f(x) =$

d. $\lim_{x \rightarrow -4^+} f(x) =$

e. $\lim_{x \rightarrow -7^-} f(x) =$

f. $\lim_{x \rightarrow \frac{1}{2}} f(x) =$

g. State all values of x in $(-9, 8)$ where f is discontinuous.

h. State all values of x in $(-9, 8)$ where f does not have a limit.

i. List the intervals (as large as possible) where f is continuous.

Score: ____/9

Problem 2: Use a graph to determine $\lim_{x \rightarrow 4^-} \ln(4 - x)$.

Score: ____/2

Problem 3: Evaluate the following limits analytically. Provide graphs of trigonometric functions when appropriate.

a. $\lim_{x \rightarrow 3^-} \frac{2x^2 - 7x + 3}{|x^2 + x - 12|}$

Score: ____/3

b. $\lim_{x \rightarrow (\frac{\pi}{2})^+} \tan(x)$

Score: /2

c. $\lim_{x \rightarrow \pi^+} \frac{1-x}{\sin(x)}$

Score: /3

d. $\lim_{h \rightarrow 0} \frac{(h-5)^2 - 25}{h}$

Score: /3

e. $\lim_{x \rightarrow \infty} \frac{6x^5 - 3x^3 + 7x}{4x^2 - 8x + 101}$

Score: /3

Calculators allowed from here on.

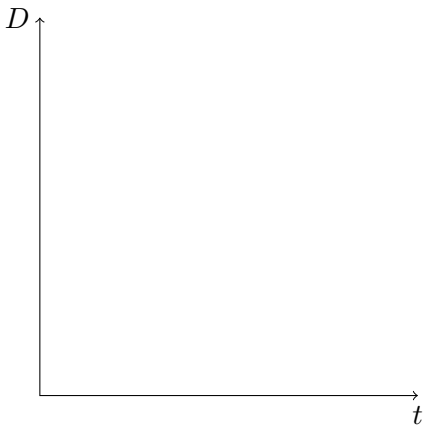
Problem 4: The number of people infected due to an influenza epidemic can be modelled by

$$D(t) = \frac{93\,700}{1 + 5095.9634e^{-0.156739t}},$$

where $D(t)$ is the number of people infected t days after the model began describing the situation.

- a. Use a table to estimate $\lim_{t \rightarrow \infty} D(t)$. What does this limit represent?

x	$f(x)$	x	$f(x)$



- b. Based on your answers to Part a, what do you expect the value of

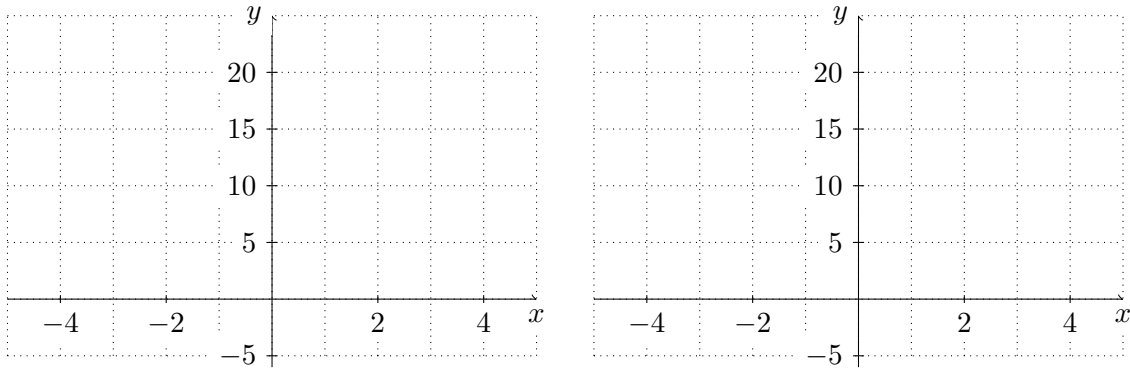
$$\lim_{t \rightarrow \infty} \frac{A}{1 + Be^{-kt}} \quad \text{for constants } A, B, k > 0$$

to be? Show analytically that your guess is correct.

Problem 5: Consider the function f given by

$$f(x) = \begin{cases} x^2, & x \leq c \\ 6 + x, & x > c \end{cases}$$

Use the definition of continuity to determine all values of c for which f is continuous on its entire domain. Draw your graphs.



Score: /4

Problem 6: State the Squeeze Theorem. Can you use it to determine

$$\lim_{x \rightarrow 0} x^2 \cos\left(\frac{1}{x^2}\right) \quad ?$$

If so, find the limit. If not, provide reasons.

Score: /4

Problem 7: State the Intermediate Value Theorem. Consider $f(x) = \frac{1}{x}$. Compute $f(2)$ and $f(-2)$ and discuss whether you can find a value for x such that $f(x) = 0$. Use the theorem you just stated to support your argument.

Score: /4