

MATH 135 – Calculus 1  
Sample Questions for Exam 1  
September 14, 2016

I. Express the set of  $x$  satisfying  $|2x - 5| > 1$  as an interval or union of intervals.

II. The following table contains values for three different functions:  $f(x), g(x), h(x)$ .

$x$	0	0.1	0.2	0.3	0.4
$f(x)$	-4.2	-5.9	-7.6	-9.3	-11.0
$g(x)$	10	20	40	80	160
$h(x)$	4	2.3	1.5	2.1	6.1

- A) One of these is a linear function. Explain how you can tell which one it is, and give a formula for it.
- B) One of these functions is *neither linear nor exponential*. Explain which one that is and why.
- C) Give a possible formula for  $g(x)$ . (Hint: the values are doubling every time  $x$  increases by .1.)

III.

- A) Complete the square in the quadratic function  $f(x) = -3x^2 + 12x + 21$ .
- B) What is the maximum value attained by the function  $f(x)$ , and for which  $x$  is the maximum achieved?
- C) Where does the graph  $y = f(x)$  cross the  $x$ -axis?
- D) Sketch the graph  $y = -3x^2 + 12x + 21$  for  $x$  in  $[-4, 4]$  and showing correct scales on both the  $x$ - and  $y$ -axes.

IV. You start at  $x = 0$  at time  $t = 0$  (hours) and drive along the  $x$ -axis ( $x$  values in miles) at 40 miles an hour for 2 hours. At  $t = 2$  you stop for one hour. Then starting at  $t = 3$ , you retrace your earlier path and return to your starting position at 80 miles per hour.

- A) Sketch the graph of your position as a function of time.
- B) Give (piecewise) formulas for your function on the appropriate  $t$ -intervals.

V.

- A) Express the domain of the function  $f(x) = \frac{x}{x^2-1}$  as a union of intervals.
- B) Figure 1 on the back of this page shows the graph  $y = \frac{x}{x^2-1}$ . Based on this, what can you say about the range of  $f(x)$ ?

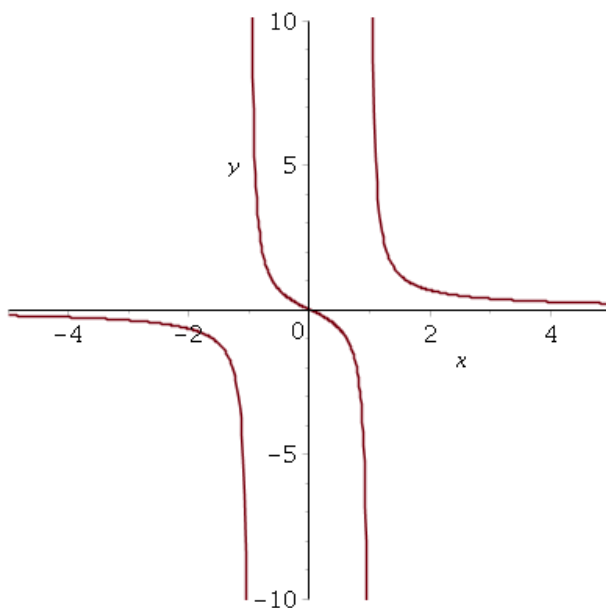


Figure 1: Figure for Question V

- C) Explain why  $f(x)$  (on its default domain) *fails* to have an inverse function.
- D) Give a restricted domain on which  $f(x)$  *does* have an inverse function, and sketch the graph of the inverse.

VI.

- A) Sketch the graph  $y = 3 \sin\left(\frac{x}{2}\right) + 2$  for  $0 \leq x \leq 8\pi$ .
- B) What are the *amplitude* and *period* of this sinusoidal function?
- C) What would change in your answer to B) if the formula was  $y = \frac{1}{3} \sin(2x) + 2$ ?

VII.

- A) Simplify:  $\log_3(27) + \ln(e^{-3})$ .
- B) Solve for  $x$ :  $2^{x+3} = 3^{x/2}$ .
- C) The population of a city (in millions) at time  $t$  (years) is  $P(t) = 2.4e^{0.06t}$ . What is the population at  $t = 0$ ? When will the population reach 4 million?
- D) (Continuation of C) How long will it take for the population to reach double the number at  $t = 0$ ?