MATH 1310- 001— Midterm 1   Name: _____

Date: 09/15/2017

Instructor: James MacLaurin

No phones, calculators, or notes! Remember to show all your work.

1. (20 points) (**Limits**) Compute the following limits, or explain why the limit does not exist.
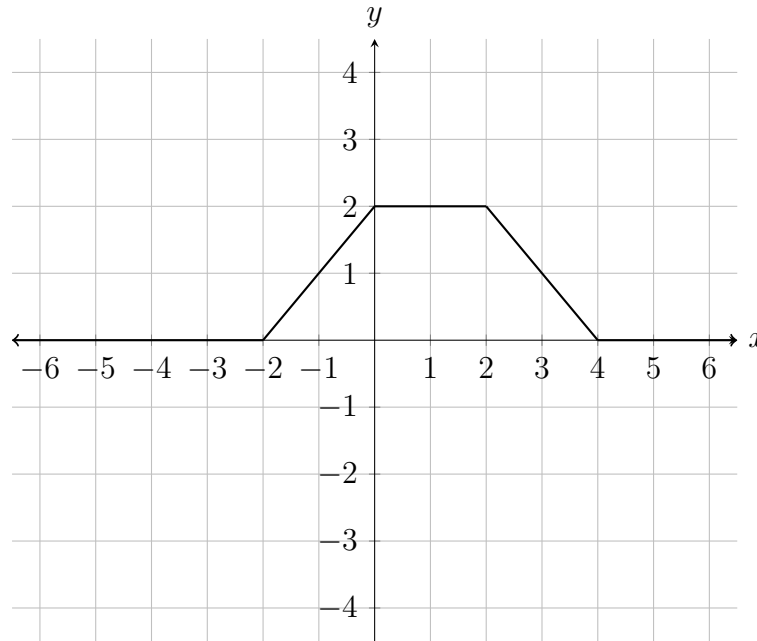
(a) $\lim\limits_{x \to 3} \dfrac{|x-3|}{x-3}$.

(b) $\lim\limits_{x \to 2} \dfrac{x^2 - x - 2}{x^2 - 4}$.

(c) $\lim\limits_{x \to \infty} \dfrac{4x^2 + 3\sqrt{x}}{2x^2 - 2}$

2. (20 points) (**Function transformation**). Consider the function $f(x)$ depicted in the graph. Draw a graph of the transformed function

$$-2f(x+2)$$

on the same axes.

3. (20 points) (**Slope**) Find the equation $y = mx + b$ for the secant line of the function $f(x) = x^2 - x - 1$ that passes between points $x = 0$ and $x = 2$.

4. (20 points) (**Finding the inverse**) Consider the function

$$f(x) = \ln\left(\frac{x}{2x-3}\right).$$

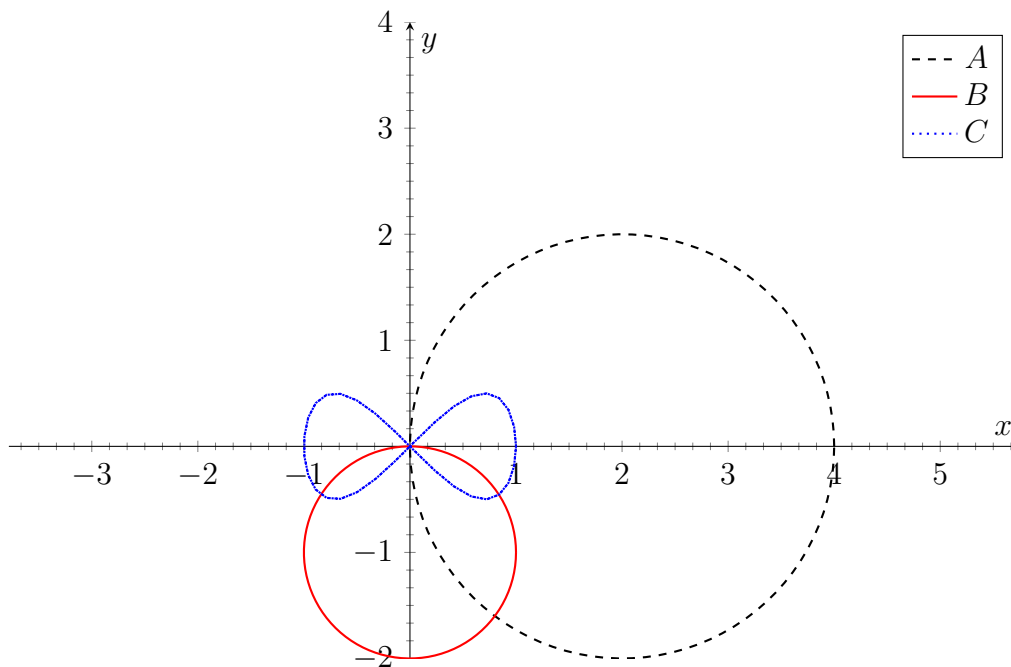(a) Determine the inverse f^{-1}.

(b) Find the domain of $f(x)$.

5. (20 points) (**Parametric equations**) Consider the parametric equations

    (a) $x = 2\cos(t) + 2, \quad y = 2\sin(t)$

    (b) $x = \cos(3t), \quad y = \frac{1}{2}\sin(6t)$

    (c) $x = \cos(t), \quad y = \sin(t) - 1$

where $0 \leq t \leq 2\pi$. Match each of them with the corresponding curve in the figure below. Explain your choice (you only need to explain two of your choices, since the third follows by elimination).

6. (20 points) (**Domain and range**) Specify the domain and range of

$$f(x) = \frac{1}{4} \ln(5^2 - x^2).$$

You may express the solution in terms of the natural log of an integer.