MATH 141: Midterm 1

Name: _____

Directions:

* Show your thought process (commonly said as ”show your work”) when solving each problem for full credit.
* If you do not know how to solve a problem, try your best and/or explain in English what you would do.
* Good luck!

Problem	Score	Points
1		10
2		10
3		10
4		10
5		10
		50

1. Short answer questions:

   (a) Suppose you write

   $$(x+y)^2z^2 = x^2 + y^2z^2$$

   What are the two errors you made?

   (b) True or false: We can simplify

   $$\frac{(x+1)(x-2)+(x-2)(x+3)}{(x+1)^2}$$

   by crossing out the $x+1$.

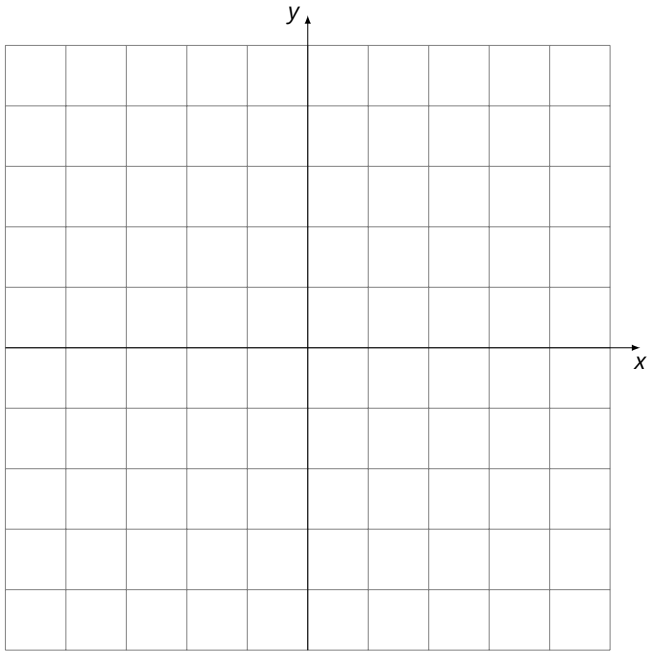
   (c) If $f(x) = x^2 - x$, evaluate $f(x-h)$ and fully expand + simplify.

   (d) If $F(x) = \cos^2(x^3)$ find three functions f, g, h where $f \circ g \circ h = F$.

2. Suppose

$$f(x) = \begin{cases} x^2 - 1 & x < -1 \\ -2^x + 2 & x \geq -1 \end{cases}$$

(a) Sketch a graph of $f(x)$.



(b) What is $f(-1)$?

(c) Does $\lim_{x \to -1} f(x)$ exist? Why or why not?

3. Perform the given instruction. Remember to use the relevant laws/properties and fully simplify.

   (a) Simplify: $\left(\dfrac{x+1}{(x-1)}\right)^2 \cdot \left(\dfrac{(x-1)(x+1)}{x+2}\right)^{-2}$

   (b) Expand: $(x-2)^2(x+3)+(x-3)(x+2)$

(c) Completely factor (you should have four factors): $x^4 - 5x^2 + 4$

(d) Simplify: $\dfrac{x^2h + 2xh + h}{h}$

4. Draw the graph of a function which satisfies the following:

   (a) $f(0) = -1$

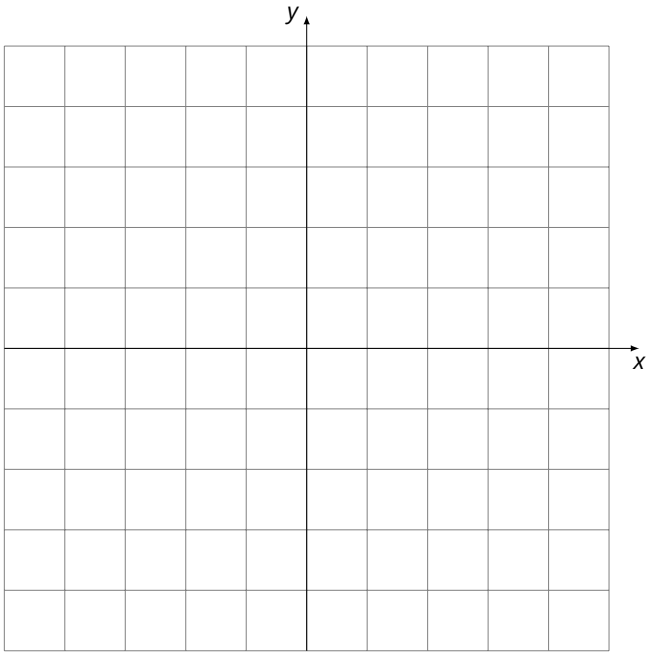
   (b) $f(3) = 1$

   (c) $\lim_{x \to 0} f(x) = 1$

   (d) $\lim_{x \to 3^-} f(x) = -2$

   (e) $\lim_{x \to 3^+} f(x) = 2$

   (f) $\lim_{x \to -2} f(x) = \infty$



5. If

$$f(x) = \frac{1}{x} \qquad g(x) = \cos(x) \qquad h(x) = \sin(x) \qquad j(x) = e^x$$

Evaluate and fully simplify the following:

(a) $h\left(\frac{11\pi}{6}\right)$

(b) $g\left(\frac{5\pi}{4}\right)$

(c) $g\left(\pi \cdot j(0)\right)$

(d) $\frac{f(x+h) - f(x)}{h}$