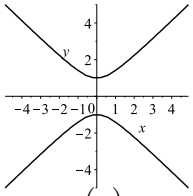
MATH 150

Exam 1 **Wednesday, September 16, 2020**

Name:_____

Remember to **show your work**. Unsupported solutions will receive no credit.

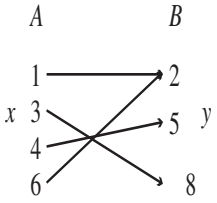
1. (10 points) **(a)** Which of the following show y as a function of x? Also indicate which do not. **(b)** For each one that is a function, also indicate whether it has an inverse.



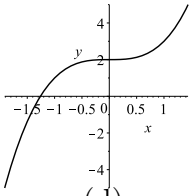
(a)

x	1	2	3	4	5
y	-2	4	-2	-8	2

(b)



(c)



(d)

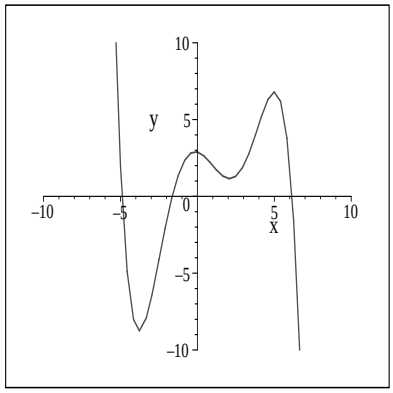
2. (5 points) Let $f(x) = 2 + x^2$. Determine the average rate of change of f over the interval $[1, 3]$.

3. (5 points) Find an equation of the line through $(2, 1)$ and $(4, -3)$.

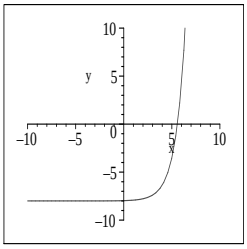
4. (10 points) Use the table below to approximate $\lim_{x \to 2} \dfrac{f(x) - f(2)}{x - 2}$.

x	1.9	1.99	1.999	2	2.001	2.01	2.1
$f(x)$	1.3784	1.4107	1.4139	1.4142	1.4146	1.4177	1.4491

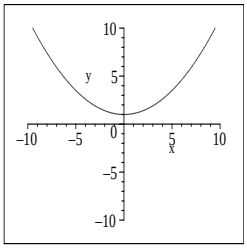
5. (15 points) The function f is graphed below. On the same set of axes, sketch the graph of $f(x+2)-3$.



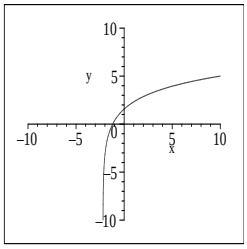
6. (10 points) Three functions are graphed below. Which has the greatest average rate of change over the interval $[2,7]$? Which has the smallest average rate of change over the interval $[2,7]$?



$y = f(x)$



$y = g(x)$



$y = h(x)$

7. (10 points) What is the effect on the graph of $y = f(x)$ of each transformation?

(a) _____ $y = -f(x)$

(b) _____ $y = f(-x)$

(c) _____ $y = f(x+1)$

(d) _____ $y = f(x)+1$

(e) _____ $y = 2f(x)$

8. (10 points) Identify each discontinuity of each function and classify it (point, jump, or infinite).

(a) $f(x) = \dfrac{x^2+1}{x-3}$ _____

(b) $f(x) = \dfrac{(2x-3)(4x+1)}{(4x+1)(x-2)}$ _____

9. (10 points) Compute each limit.

   (a) $\lim_{x \to 5} \dfrac{x^2 - 2x + 3}{x^2 + 1}$

   (b) $\lim_{h \to 0} \dfrac{(3+h)^2 - 3^2}{h}$

   (c) $\lim_{x \to 3} \dfrac{x^2 - 7x + 12}{x - 3}$

   (d) $\lim_{x \to \infty} \dfrac{3x^2 - 6x + 1}{2x^2 + 5x + 2}$

10. (5 points) The **Lorentz factor** is a function that shows up in relativity; $f(v) = \dfrac{1}{\sqrt{1 - \dfrac{v^2}{c^2}}}$, where c is the speed of light. Since nothing can go faster than light, any limit for v approaching c must come from the left. Find $\lim_{v \to c^-} \dfrac{1}{\sqrt{1 - \dfrac{v^2}{c^2}}}$.

11. (10 points) Solve the inequality $\dfrac{(x-3)^2(x+2)}{2x+5} \geq 0$ and express your answer in interval notation.