

WRITE YOUR NAME:

MAC 2241 Homework 1

Due in class, Friday January 26th

You can use more paper if necessary, but please STAPLE

Question 1. If $f(x) = x^3$, simplify the expression.

$$\frac{f(a+h) - f(a)}{h}$$

$$\frac{(a+h)^3 - a^3}{h} = \frac{(a^3 + 3a^2h + 3ah^2 + h^3) - a^3}{h}$$

$$= \frac{3a^2h + 3ah^2 + h^3}{h} = \frac{(3a^2 + 3ah + h^2)h}{h}$$

$$= 3a^2 + 3ah + h^2$$

Question 2. Find the domain of the function.

$$f(x) = \sqrt{8-x} - \sqrt{5+x}$$

Since expression contains $\sqrt{8-x}$, we must have $8-x \geq 0$
 $8 \geq x$

$$x \leq 8$$

Since expression contains $\sqrt{5+x}$, we must have $5+x \geq 0$
 $x \geq -5$

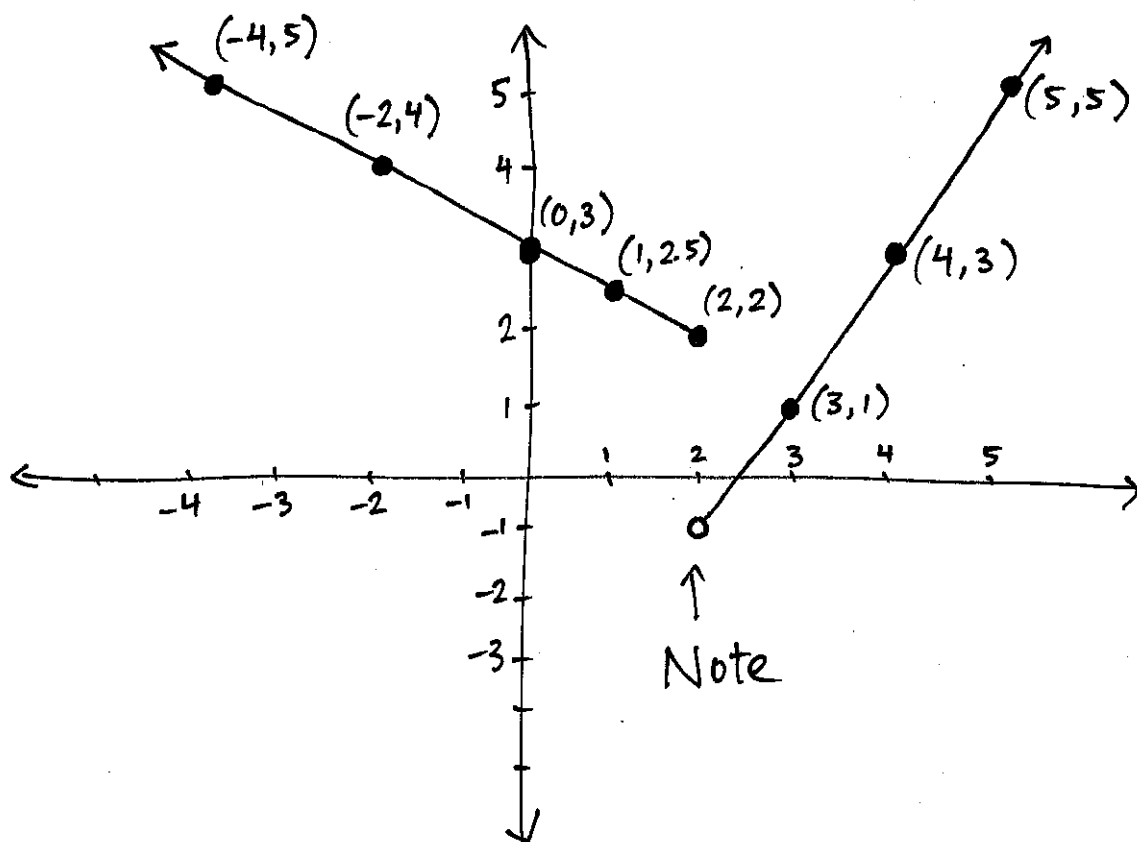
So, we must have both $x \leq 8$ and $x \geq -5$

Domain: $-5 \leq x \leq 8$

Or in interval notation: $[-5, 8]$

Question 3. Draw a reasonable graph of the function. Label at least five points.

$$f(x) = \begin{cases} 3 - \frac{1}{2}x & \text{if } x \leq 2 \\ 2x - 5 & \text{if } x > 2 \end{cases}$$



Remember there are many x values between 2 and 3.

For example, x could be 2.001.

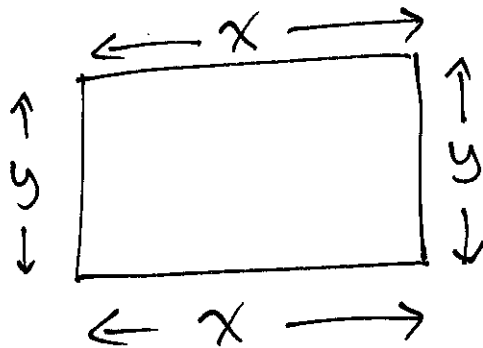
If $x = 2.001$ then $x > 2$

$$\begin{aligned} \text{and } f(x) &= f(2.001) = 2(2.001) - 5 \\ &= 4.002 - 5 \end{aligned}$$

which is very close to -1 .

Question 4. A rectangle has a perimeter of 20 meters. Express the area of the rectangle as a function of the length of one of its sides.

Could call the two sides x and y



$$\text{Perimeter} = x + y + x + y = 2x + 2y$$

$$\text{Perimeter} = 20 \quad \Rightarrow \quad 2x + 2y = 20$$
$$x + y = 10$$

$$\text{Area} = xy$$

$$\downarrow$$
$$y = 10 - x$$

Area expressed as a function of one side length
could be

$$xy = \underline{x(10-x)} \quad \text{or} \quad \underline{10x - x^2}$$