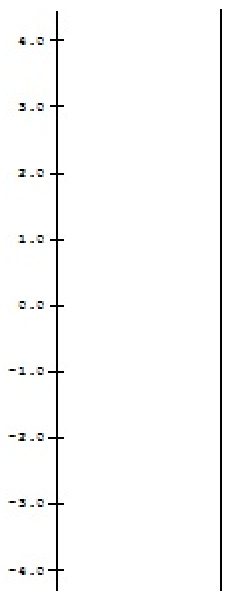
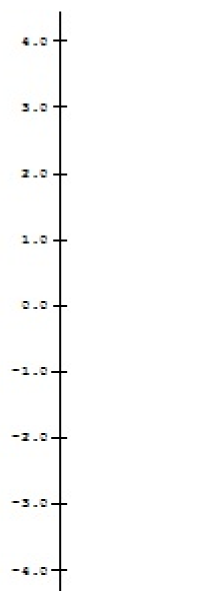
1.

a. Complete the following tables for $m(x) = 2x$ and $s(x) = x + 1$

x	$m(x) = 2x$	$s(x) = x + 1$
2		
1		
0		
-1		
-2		

b. Using the data from part a), on separate diagrams sketch mapping diagrams for $m(x) = 2x$ and $s(x) = x+1$





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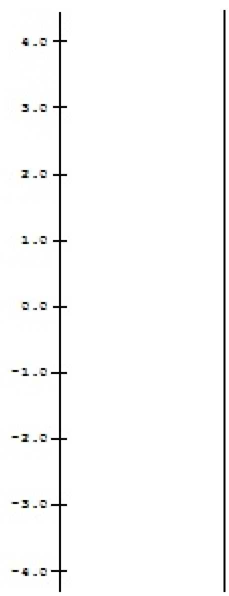
2. Let $q(x) = x^2$.

a. Complete the following table for $q(x) = x^2$.

x	$q(x) = x^2$
2	
1	
0	
-1	
-2	

b. Using the data from part a), sketch a mapping diagram for $q(x) = x^2$.



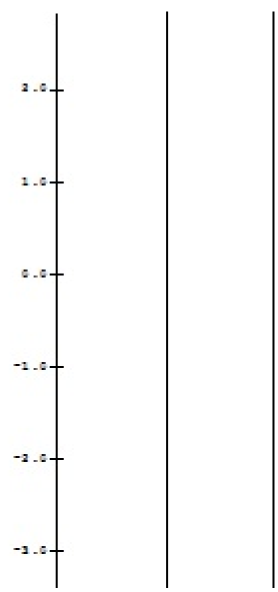
3.

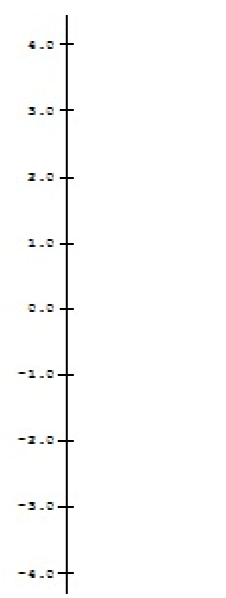
a. Complete the following table for the composite function $f(x) = s(m(x)) = 2x + 1$.

x	$m(x) = 2x$	$s(m(x)) = 2x + 1$
2		
1		
0		
-1		
-2		

b. Use the table and the previous sketches of 1.b to draw a composite sketch of the mapping diagram with 3 axes for the composite function $f(x) = s(m(x)) = 2x + 1$

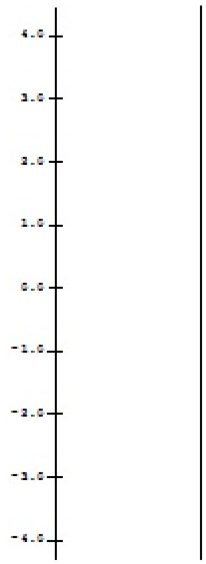
c. Draw a sketch for the mapping diagram with 2 axes of $f(x) = 2x + 1$.



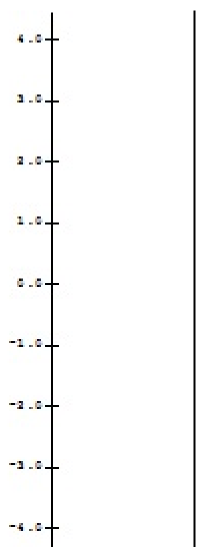


4. Let $\boldsymbol{f}(\mathbf{x}) = \mathbf{mx + b}$ sketch mapping diagrams for the following:
Use the same scale for the second axis.

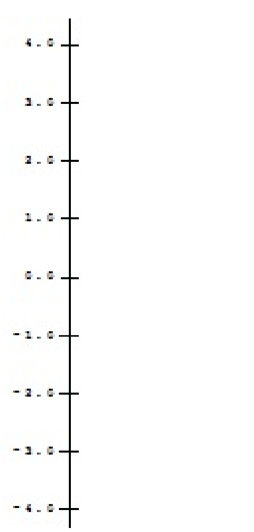
a. m = -2; b = 1: $f(x) = -2x + 1$;



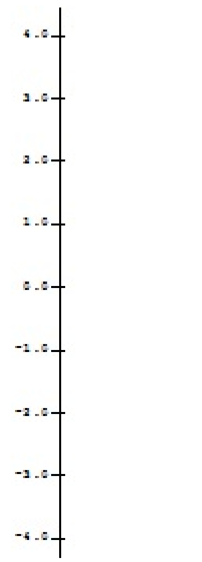
b. m = 2 b = 1: $f(x) = 2x + 1$



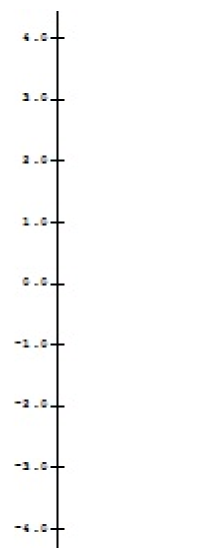
c. m = ½; b = 1: $f(x) = ½ x + 1$



d. m = 0; b = 1: $f(x) = 0 x + 1$



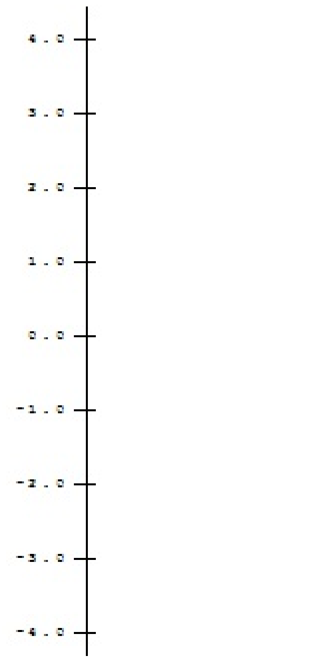
e. m = 1; b = 1: $f(x) = x + 1$



5. Suppose f is a linear function with $f(1) = 3$ and $f(3) = -1$.

a. Use a focus point to find $f(0)$.

b. Use a focus point to find x where $f(x) = 0$.



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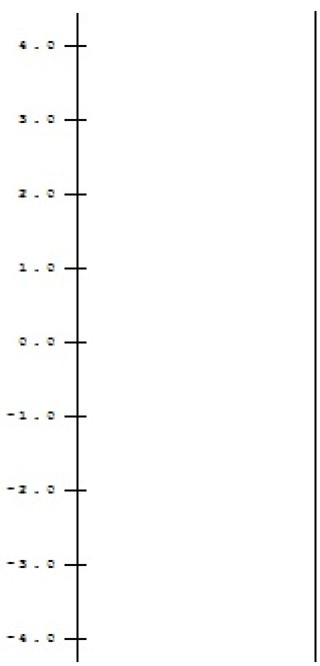
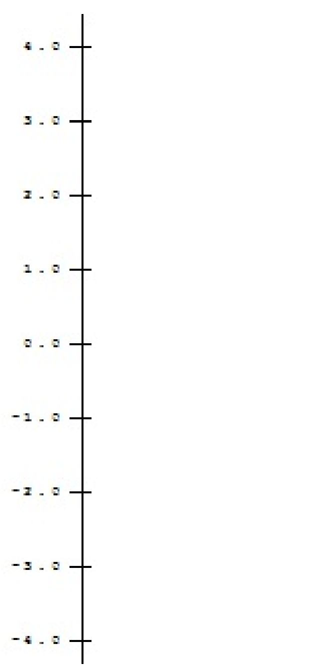
6. Suppose f is a linear function with $f(x) = 4x - 3$.

a. Sketch a mapping diagram for considering whether $\lim_{x \to 1} f(x) = 2$ with $\epsilon = ½$ and $\delta = 0.2$.

b. Sketch a mapping diagram for considering whether $\lim_{x \to 1} f(x) = 1$ with $\epsilon = ½$ and $\delta = 0.1$.





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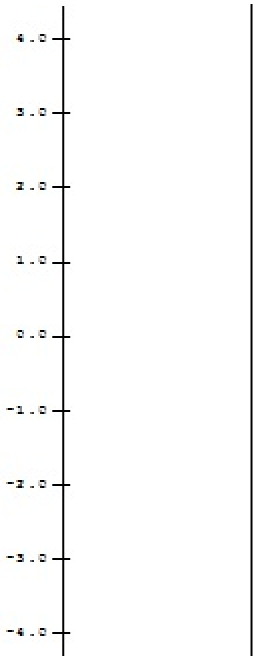
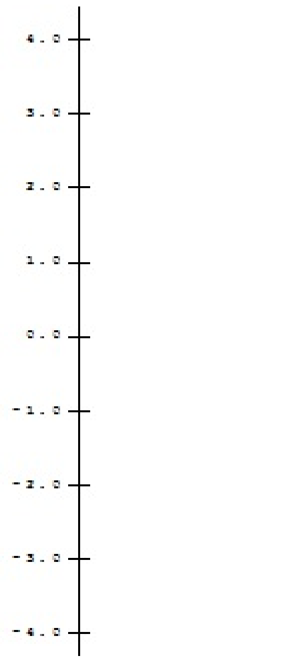
7. Let $f(x) = x^2 - 1$. Visualize an estimation of the derivative $f'(1)$ as a focus point and derivative "vector" on a mapping diagram using $\Delta x = \pm 0.1$.





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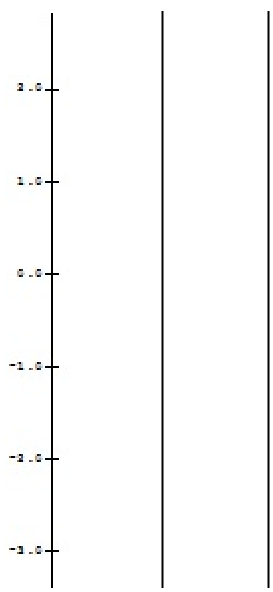
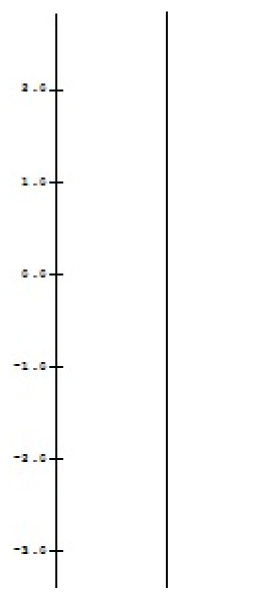
8. Let $f(x) = 2x$ and $g(x) = -3x + 1$. Visualize the composition of linear functions $f \circ g$ and $g \circ f$ using mapping diagrams.

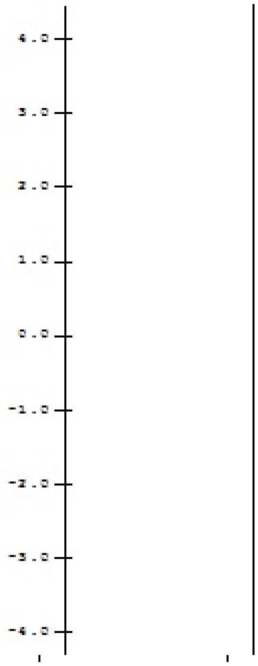


$f \circ g$



$g \circ f$

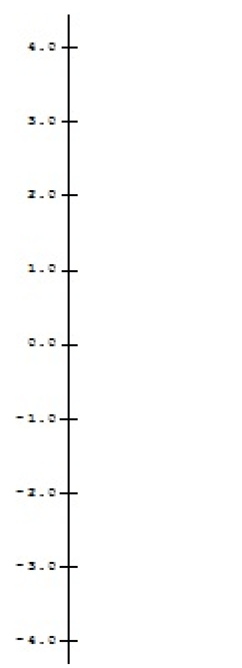
9. Let $f(x) = x^2 - 1$. Use a mapping diagram to visualize estimating the values of $f(1.1)$ and $f(0.9)$ with the differential. [Use $dx = \pm 0.1$, near the value for $x = 1$ where $f(1) = 0$, and $dy = f'(1) * dx$.]



10. Complete the following table to estimate of the solution $f(2)$ of the following initial value problem by Euler's method with $n = 4$ ($\Delta x = ½$) . Use a mapping diagram to visualize the result.

$$\frac{dy}{dx} = f'(x) = 2x - 1 \text{ with } f(0) = 1.$$

x	$f(x)$	$\frac{dy}{dx} = f'(x) = 2x - 1$	$dy = f'(x)dx = (2x-1)dx$
0	1		
1/2			
1			
3/2			
2			



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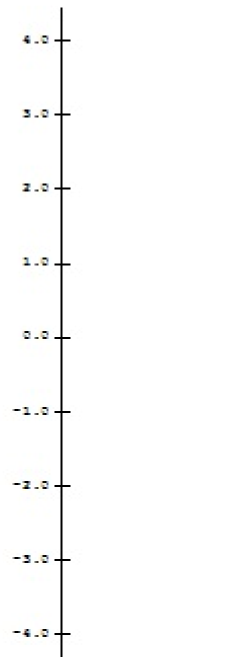
11.

a. Complete the following table to estimate $\int_0^2 2t-1\,dt$ by an Euler's sum with $n = 4$ ($\Delta t = ½$) .

Use a mapping diagram to visualize the result.

x	$\int_0^x 2t-1\,dt$	$P(t)=2t-1$	$P(t)\Delta t=(2t-1)\Delta t$
0			
1/2			
1			
3/2			
2			



b. Suppose f is a solution to $\frac{dy}{dt}=f'(t)=2t-1$.

Use the estimate for $\int_0^2 2t-1\,dt$ to estimate $f(2) - f(0)$.

c. Discuss the connection of this estimate to the mapping diagram and problem 11.

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