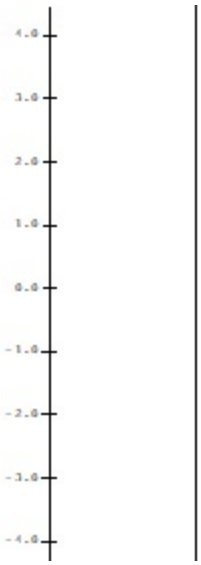
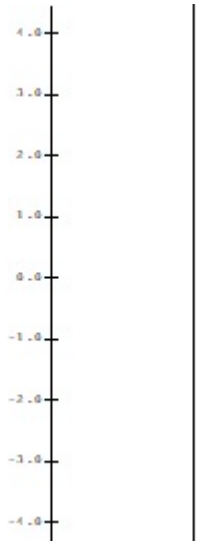
1. Let **f (x) = mx + b** sketch mapping diagrams for the following:
Use the same scale for the second axis.

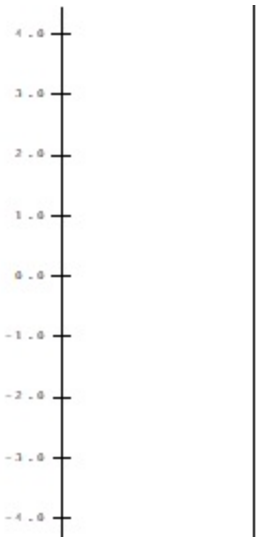
a. m = -2; b = 1: $f(x) = -2x + 1$;



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



c. m = ½; b = 1: $f(x) = ½ x + 1$

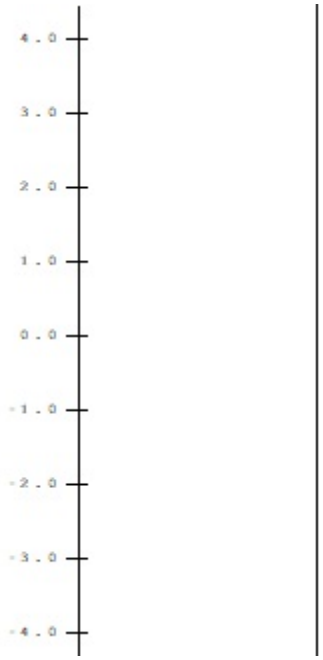


d. m = 0; b = 1: $f(x) = 0 x + 1$

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

Links:http://users.humboldt.edu/flashman/Presentations/CRR2017/MD.LINKS.II.html

2. 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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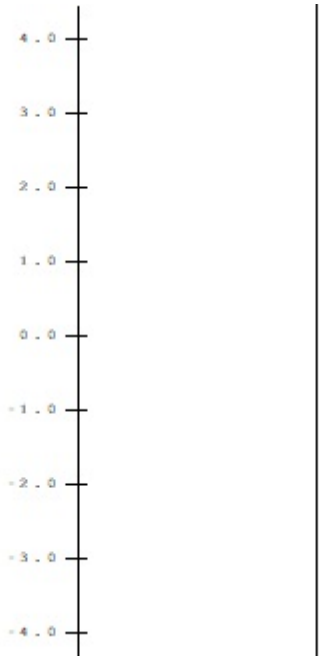
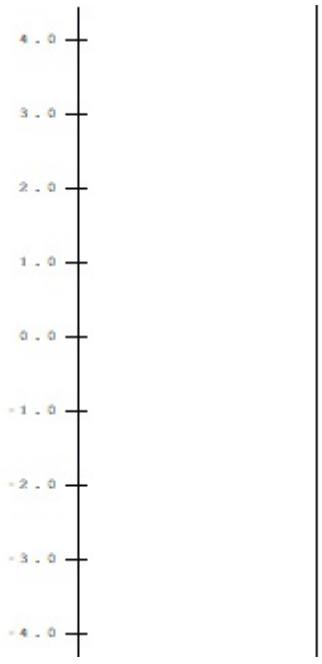
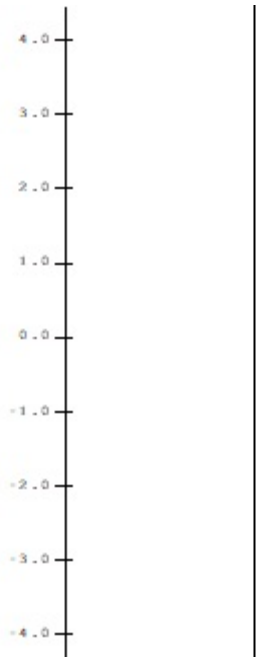
3. Suppose f is a linear function with $f(x) = 2x - 1$.
   a. Sketch a mapping diagram for considering whether $\lim_{x \to 1} f(x) = 1.5$ with $\epsilon = ½$ and $\delta = 0.5$.

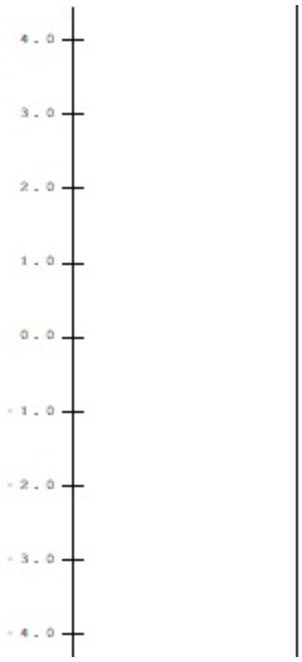


   b. Sketch a mapping diagram for considering whether $\lim_{x \to 1} f(x) = 1$ with $\epsilon = ½$ and $\delta = 0.25$.



4. 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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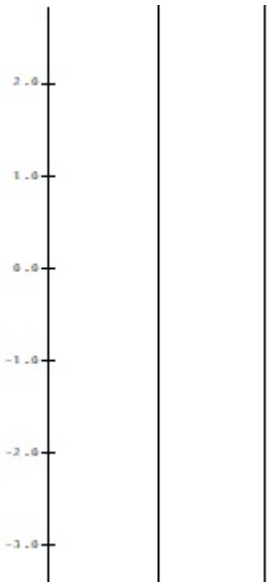
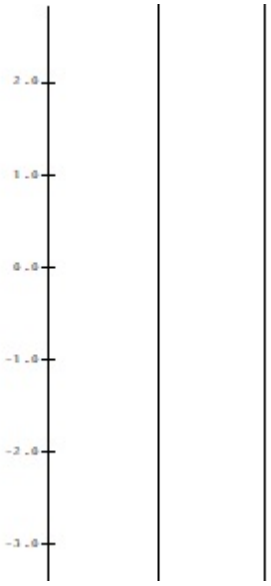
5. Let $f(x) = 2x$ and $g(x) = -3x + 1$. Visualize the composition of linear functions $f \circ g$ and $g \circ f$ using mapping diagrams.



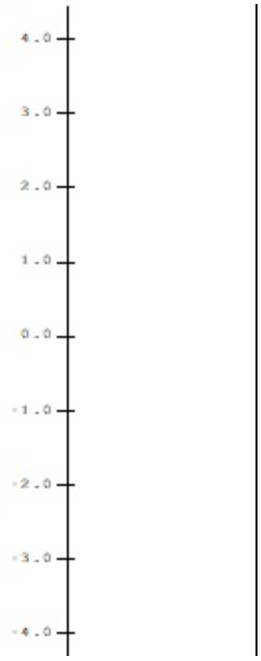
$f \circ g$



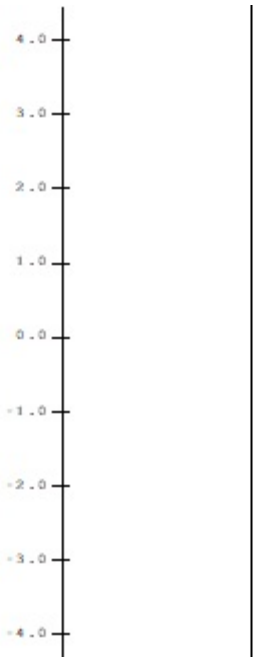
$g \circ f$

Links:http://users.humboldt.edu/flashman/Presentations/CRR2017/MD.LINKS.II.html

6. Let $f(x) = x^2 - 2$. Use a mapping diagram to visualize the bisection method for finding a zero by considering $x = 1$ and $x = 2$ and proceeding for two bisections.



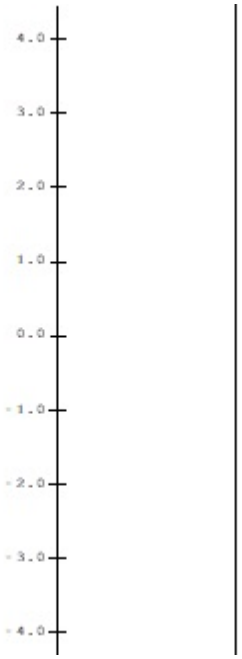
7. Let $f(x) = x^2 - 1$. Use a mapping diagram to visualize estimating the values of $f(1.1)$ and $f(0.9)$ with the differential. [Use $dx = \pm 0.1$, near the value for $x = 1$ where $f(1) = 0$, and $dy = f'(1) * dx$.]



8. 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.

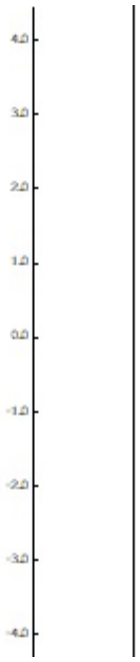
$\frac{dy}{dx} = f'(x) = 2x - 1$ with $f(0) = 1$.

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			



9. Complete the following tables for $P(x)$ to estimate $\int_1^3 f'(t)\,dt$ using Euler's Method and visualize the estimation with a mapping diagram.

x	$\int_1^x f'(t)\,dt$	$f'(t)$	$f'(t)\,\Delta t$
1		4	
1.5		2	
2		3	
2.5		5	
3			



10. Visualize the additive property of the definite integral, $\int_a^c P(x)\,dx + \int_c^b P(x)\,dx = \int_a^c P(x)\,dx$, with a mapping diagram with $P(x) = 2x$, $a = 1$, $b = 3$, $c = 2$.

[Use your knowledge of the FT of C to find the actual integrals. Adjust the scale for the target as needed to make the diagram fit on the given axes.]

$\int_1^2 2x\,dx =$ _____

$\int_2^3 2x\,dx =$ _____

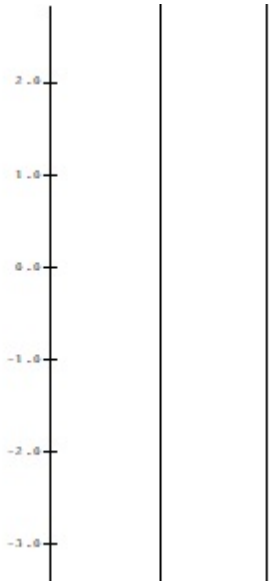
$\int_1^3 2x\,dx =$ _____

11. Visualize the scalar multiplication property of the definite integral, $\int_a^b \alpha\, P(x)\, dx = \alpha \int_a^b P(x)\, dx$, with a mapping diagram with $P(x) = 2x$, $a = 0$, $b = 2$, $\alpha = 3$. Explain your figure's connection to the equation.

[Use your knowledge of the FT of C to find the two integrals.
Adjust the scale for the three axes as needed to make the diagram fit on the given axes.
Place the integral values on the middle axis.
Apply the linear function $m(x) = 3x$ to the values on the middle axis .]

$\int_0^2 2x\, dx =$ _____

$\int_0^2 3 \cdot 2x\, dx =$ _____



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12. Visualize the mean value property of the definite integral, $\int_a^b P(x)\, dx = P(c)\cdot(b-a)$, with a mapping diagram with $P(x) = 2x$, $a = 0$, $b = 2$. Explain your figure's connection to the equation.

[Use your knowledge of the FT of C to find the integral.
Adjust the scale for the three axes as needed to make the diagram fit on the given axes.
Visualize the function P between the first and middle axes.
Find M and m - the max and min values for P on the middle axis.
Place the integral value on the third axis.
Apply the linear function $m(x) = (\boldsymbol{b-a})\, x$ to the values on the middle axis .
Indicate where c lies on the first axis.]

$\int_0^2 2x\, dx =$ _____