10.) $f(x) = \sqrt{5 - x} - 2$

$f(x) = \sqrt{-1(x - 5)} - 2$

$b = -1$

2.) $f(x) = -\left(2\left(x+\frac{1}{2}\right)\right)^2 - 4$

*down 4*

*left 1/2*

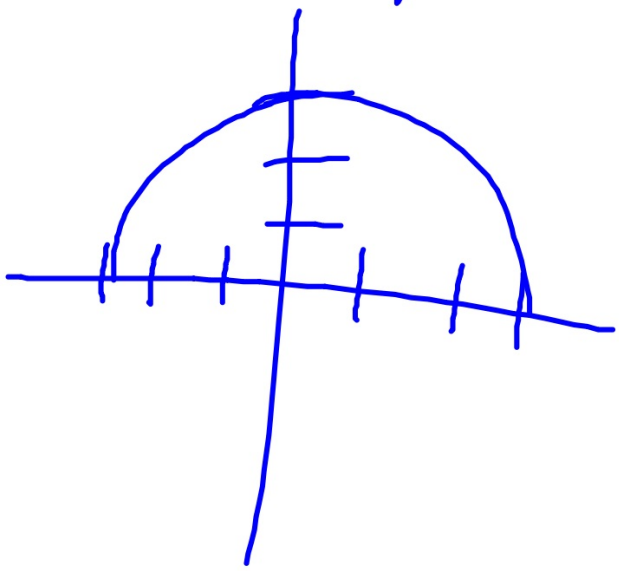
*reflection over x-axis*

*horizontal shrink by a factor of 1/2*

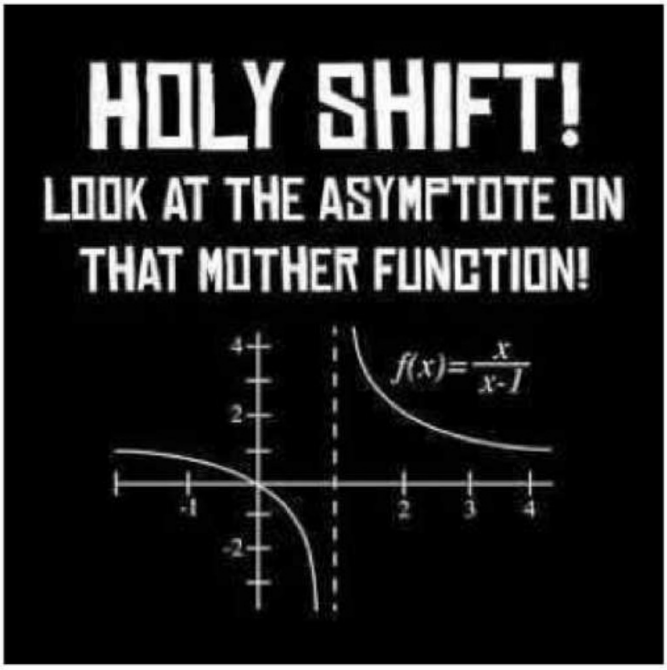
5.) $f(x) = \sqrt{9 - x^2}$

$r = 3$

$r^2$



# Library of Functions & Transformations - Day 2



HW:

## Sketching Graphs with Asymptotes

- Reciprocal
- Reciprocal of a Square
- Exponential Growth/Decay
- Natural Logarithm

### Process

1. Find the asymptote(s).
2. Plot the key point.
3. Make a table of values.

not really a point (sometimes)

ex: Sketch and state the D/R.

parent: $\frac{1}{x}$

a) $y = \frac{2}{x+3} + 4$

*up 4*

*left 3*

*vertical stretch by factor of 2*

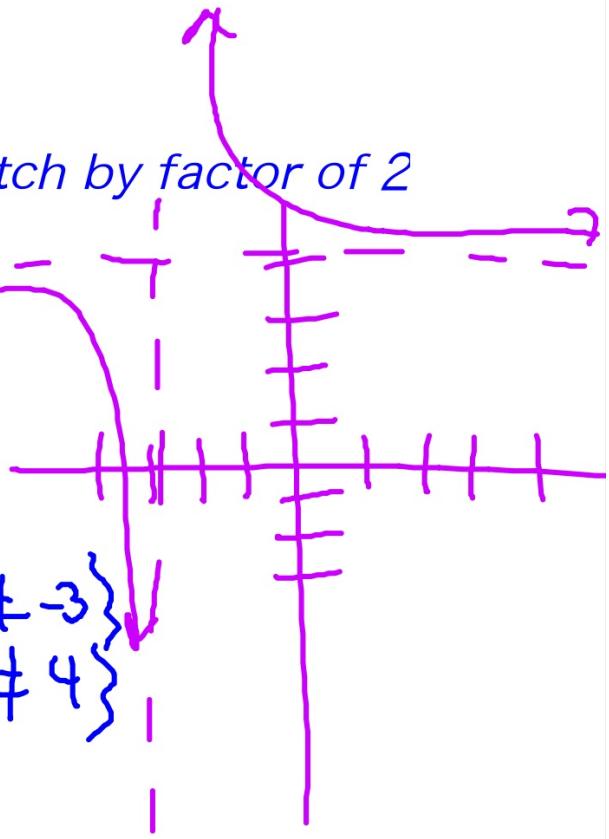
"key pt"

(-3, 4)

VA: $x = -3$

HA: $y = 4$

| x | y |
|---|---|
| -2 | 6 |
| -4 | 2 |



D: $\{x \mid x \neq -3\}$

R: $\{y \mid y \neq 4\}$

ex: Sketch and state the D/R.

b) $y = \dfrac{-5}{(x-1)^2} - 2$

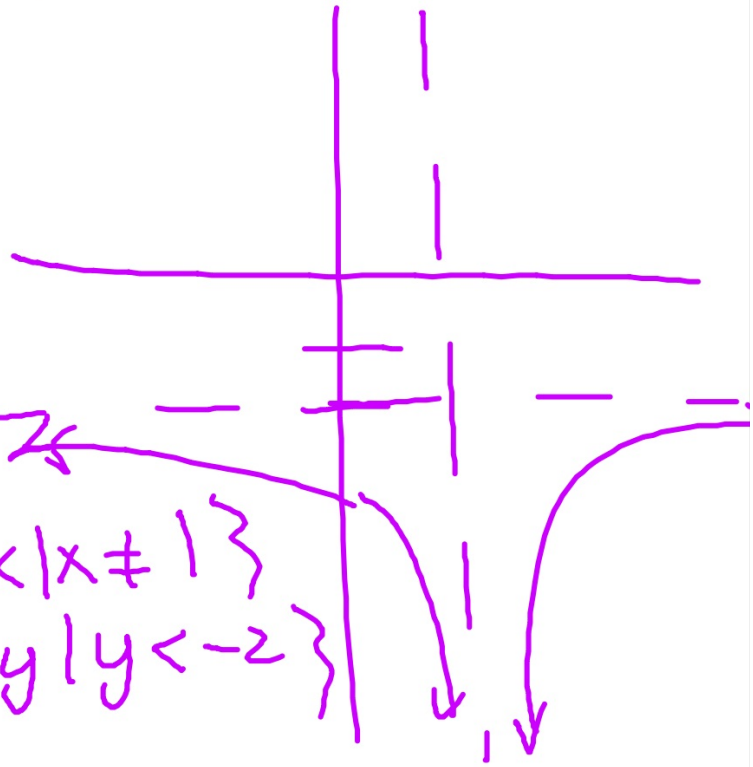
parent: $\dfrac{1}{x^2}$

"Key pt"

$(1, -2)$

VA: $x = 1$

HA: $y = -2$

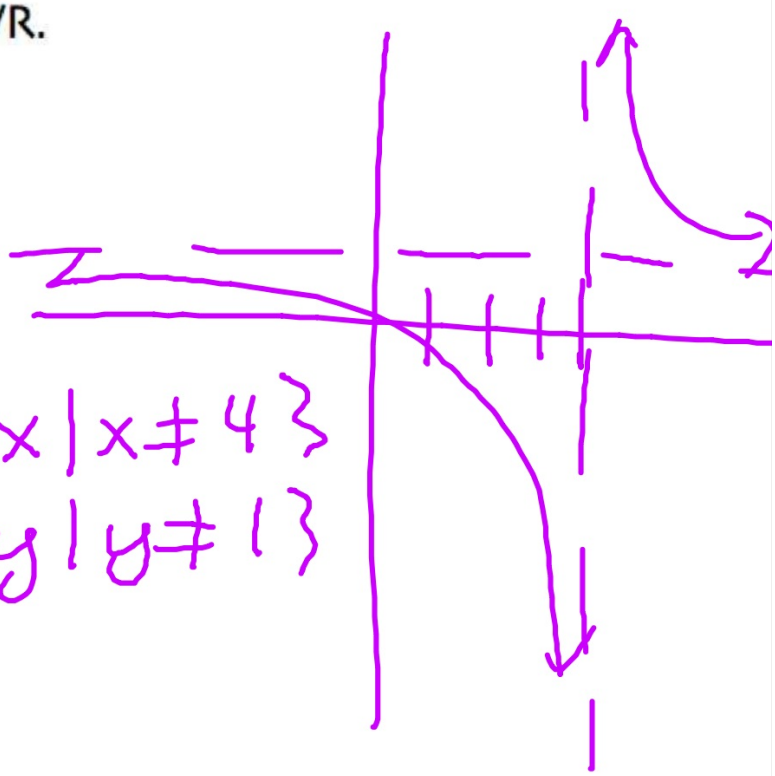


$D: \{x \mid x \neq 1\}$

$R: \{y \mid y < -2\}$

ex: Sketch and state the D/R.

c) $y = \dfrac{1}{x-4} + 1$



D: $\{x \mid x \neq 4\}$

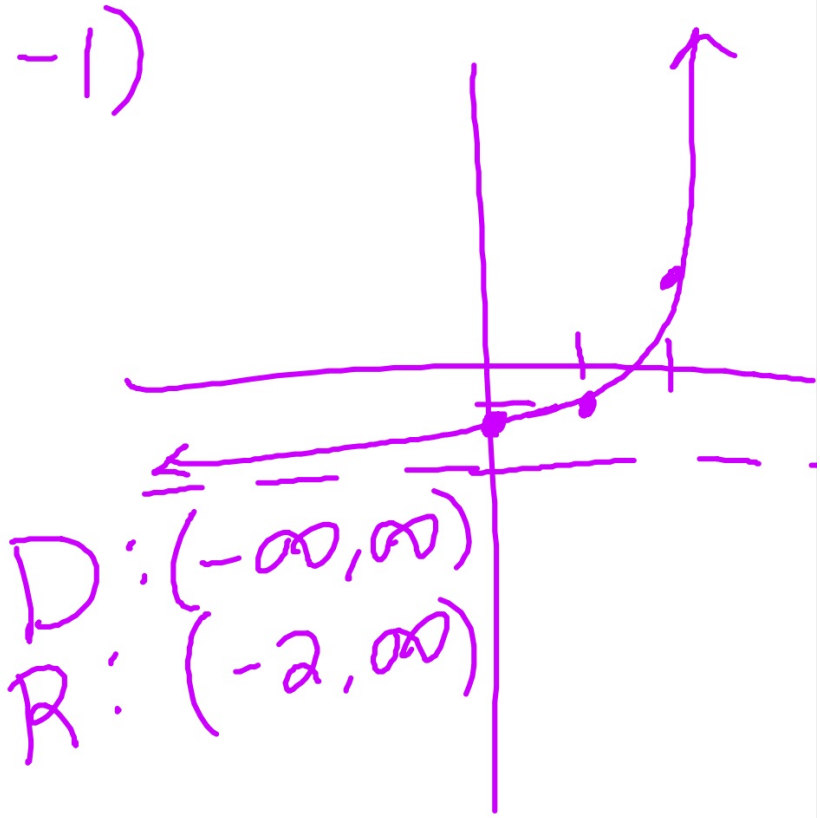
R: $\{y \mid y \neq 1\}$

ex: Sketch and state the D/R.

d) $y = 3^{x-1} - 2$

Key pt. $(1, -1)$

| x | y |
|---|---|
| 0 | $\frac{1}{3} - 2$ |
| 1 | $-1$ |
| 2 | $1$ |



$D: (-\infty, \infty)$

$R: (-2, \infty)$

ex: Sketch and state the D/R.

e) $f(x) = 2\ln x + 5$

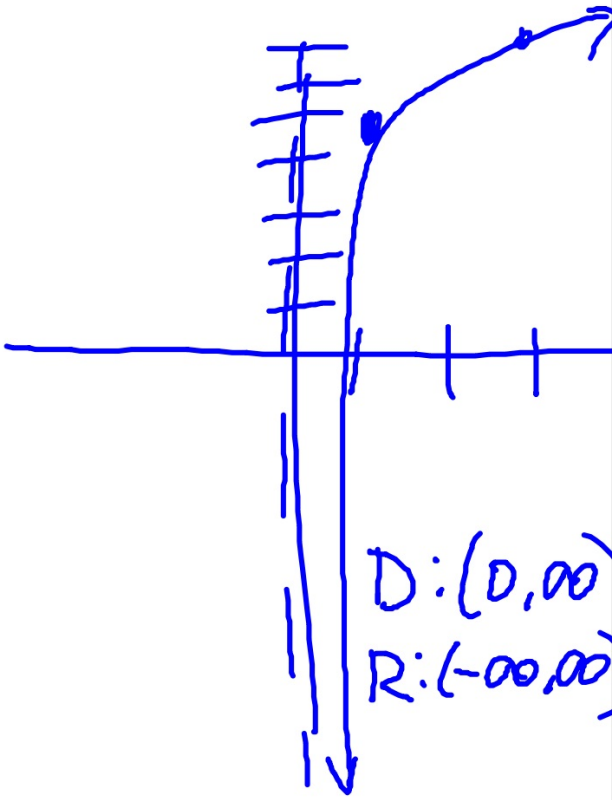
VA: $x = 0$

$y = 2\ln x + 5$

$\frac{y-5}{2} = \ln x$

$e^{\frac{y-5}{2}} = x$

| x | y |
|---|---|
| 1 | 5 |
| $e$ | 7 |



D: $(0, \infty)$

R: $(-\infty, \infty)$

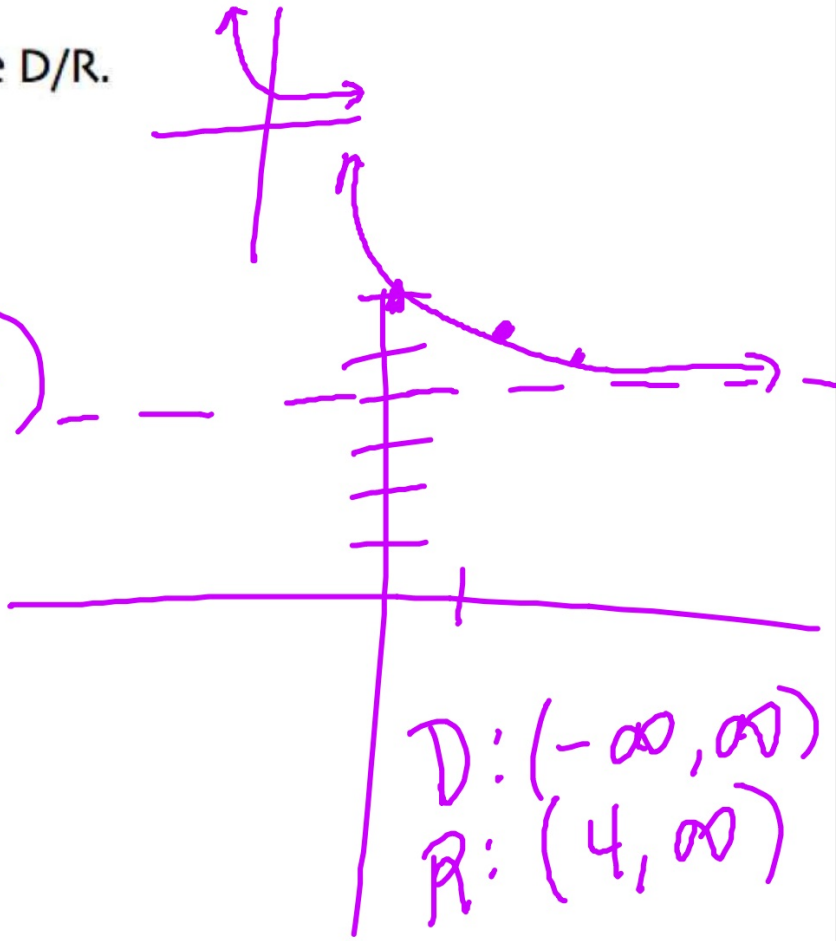
ex: Sketch and state the D/R.

f) $y = \left(\frac{1}{2}\right)^{x-1} + 4$

Key pt: (1, 5)

HA: $y = 4$

| x | y |
|---|---|
| 0 | 6 |
| 1 | 5 |
| 2 | $4\frac{1}{2}$ |



D: $(-\infty, \infty)$

R: $(4, \infty)$

## Sketching Semicircles

$$y = \sqrt{r^2 - (x-h)^2} + k$$

### Process

1. Identify the radius: $\sqrt{r^2} = r$
2. Identify the center: $(h, k)$
3. Is there a reflection?

$\sqrt{9 - x^2}$

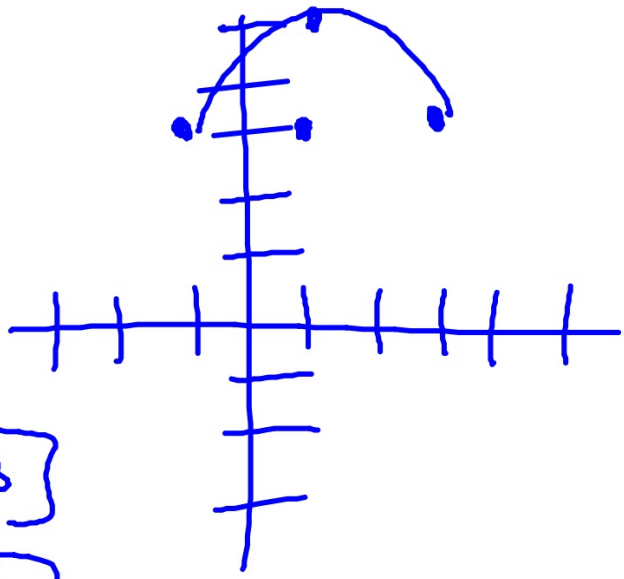
$\sqrt{9 - (x-0)^2}$

ex: Sketch and state the D/R.

g) $y = \sqrt{4-(x-1)^2} + 3$

$r = 2$

center: $(1, 3)$



D: $[-1, 3]$

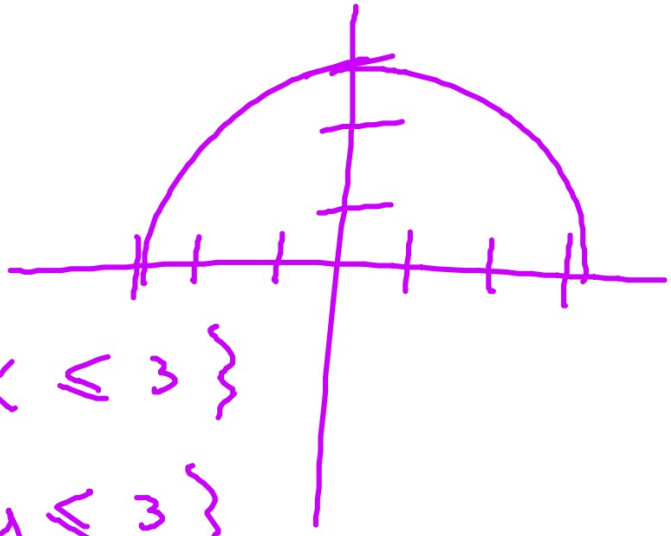
R: $[3, 5]$

ex: Sketch and state the D/R.

h) $y = \sqrt{9 - x^2}$

center: (0,0)

$r = 3$



$D: \{x \mid -3 \leq x \leq 3\}$

$R: \{y \mid 0 \leq y \leq 3\}$

ex: Sketch and state the D/R.

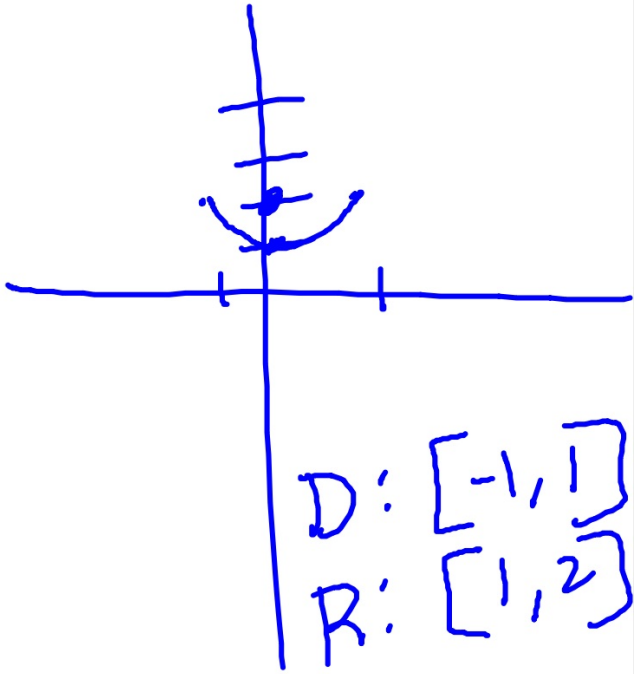
i) $y = 2 - \sqrt{1 - x^2}$

$y = -\sqrt{1 - x^2} + 2$

$r = 1$

Center $(0, 2)$

reflect about x-axis



D: $[-1, 1]$

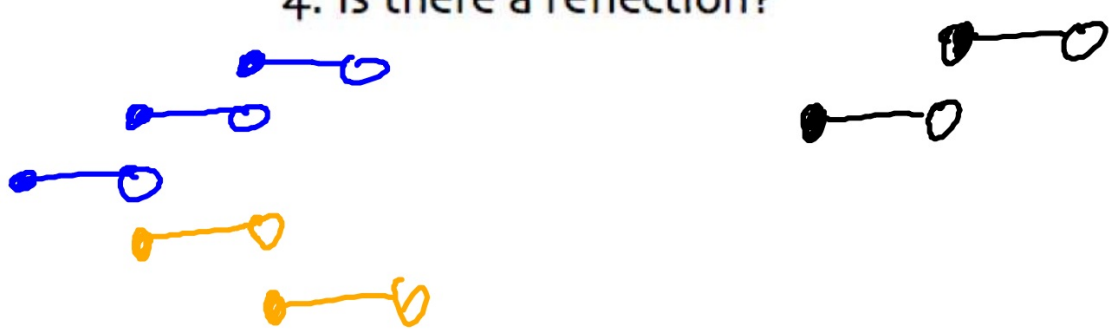
R: $[1, 2]$

## Sketching Greatest Integer

$$y = a\left[b\left(x-h\right)\right]+k$$

### Process

1. Identify the key point: $(h, k)$
2. Identify the bar length: $\frac{1}{b}$
3. Identify the vertical distance: $|a|$
4. Is there a reflection?

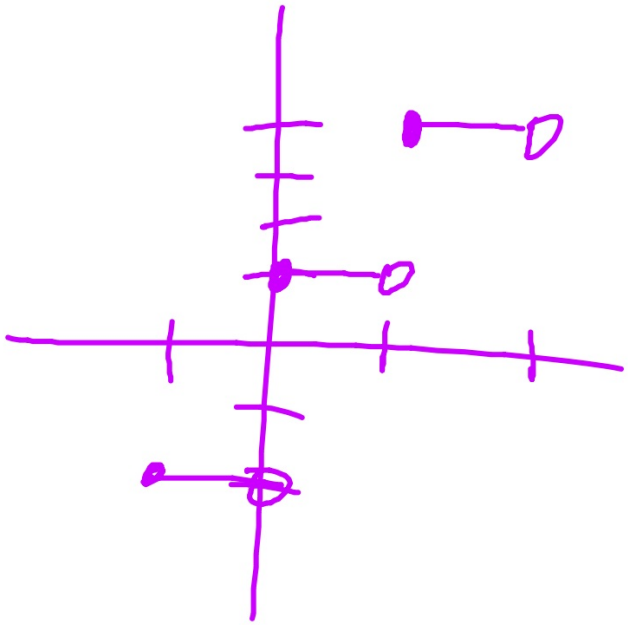


ex: Sketch and state the D/R.

j) $y = 3[x] + 1$

Key Pt : (0, 1)
length of bar : 1
distance between : 3

D : $(-\infty, \infty)$



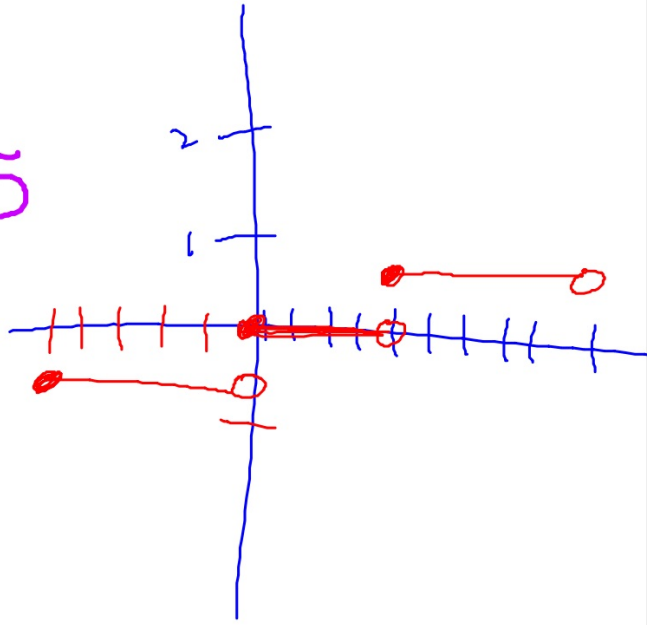
ex: Sketch and state the D/R.

k) $y = \frac{1}{2}\left[\frac{x}{5}\right]$ $= \frac{1}{2}\left[\frac{1}{5}x\right]$

Key pt: (0,0)

*length of bar* $1/1/5 = 5$

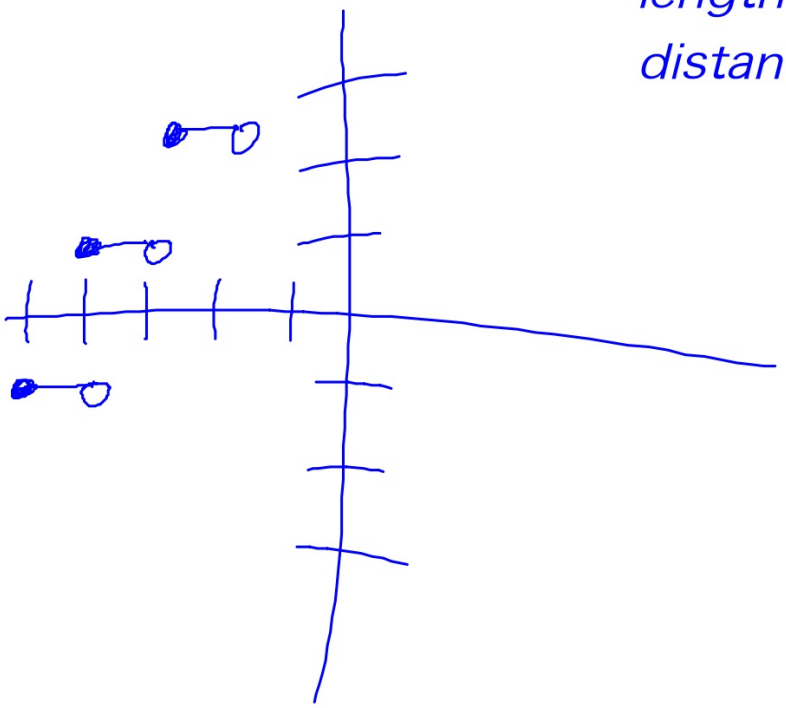
*distance between bars* $\frac{1}{2}$



ex: Sketch and state the D/R.

1) $y = 2[x+4]-1$

*Key point (-4, -1)*
*length of bar: 1*
*distance between: 2*



ex: Sketch and state the D/R.

m) $y = 4 - [2x]$ $= -[2x] + 4$

*Key point (0, 4)*

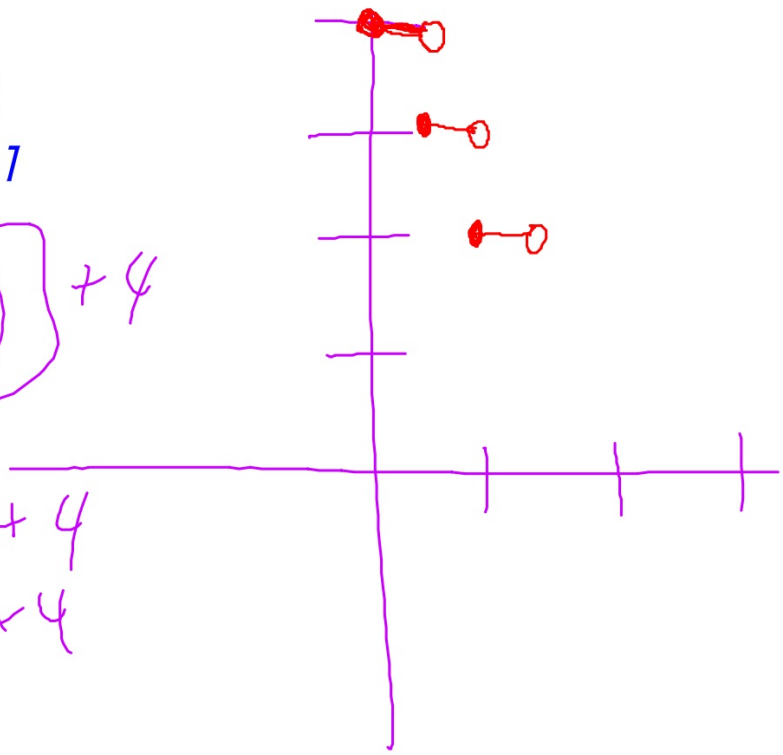
*length of bar: 1/b = 1/2*

*distance between bars: 1*

$-\left[2\left(\frac{5}{4}\right)\right] + 4$

$-\left[\frac{5}{2}\right] + 4$

$-2 + 4$



MIXED PRACTICE

ex: Identify the parent function and sketch the graph. State the domain and range in any notation.

a) $y = \dfrac{3}{(x+2)^2} + 5$

b) $y = 3(x+2)^2 + 5$

c) $y = 3\sqrt{x+2} + 5$

d) $y = \sqrt{1-x} + 1$

e) $y = \ln(x-4)$

f) $y = 3[2x-4] + 1$

g) $y = -\sqrt{9-x^2}$

h) $y = \sqrt[3]{x-4} + 1$