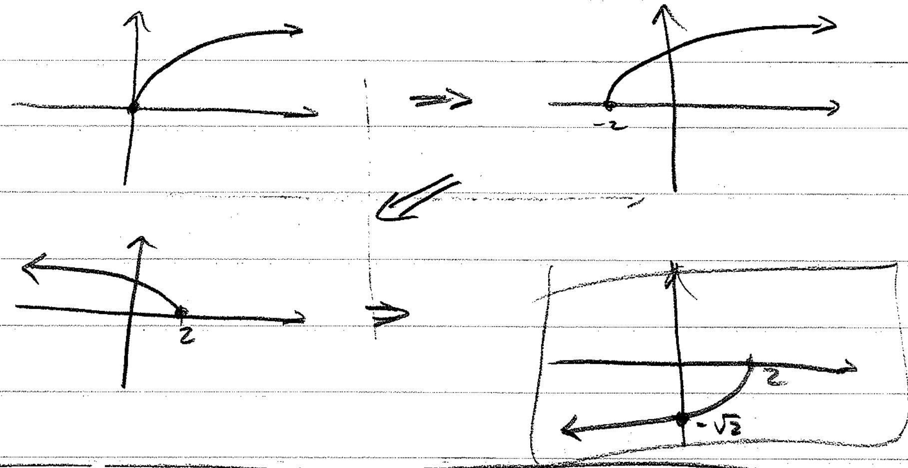
Review Problems #2

1a) we can rewrite this as

$-\sqrt{-x+2}$

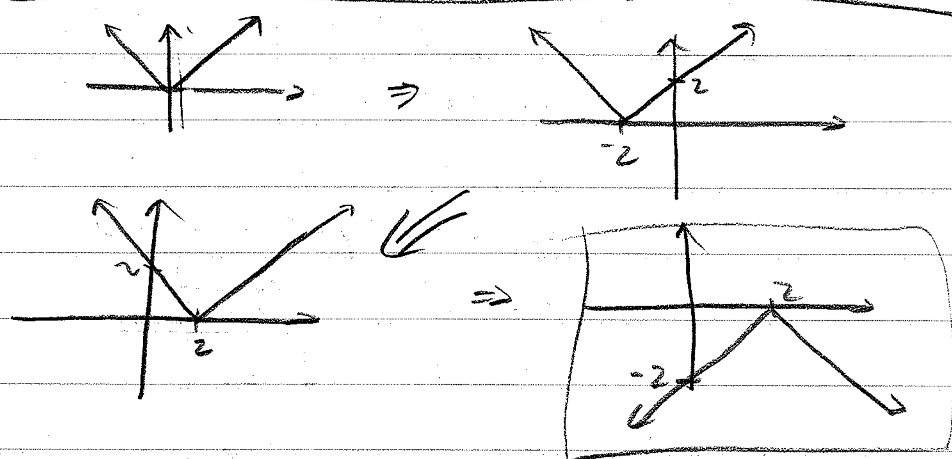
this corresponds to

- shift L by 2
- reflect y-axis
- reflect x-axis



1b) $-|-x+2|$

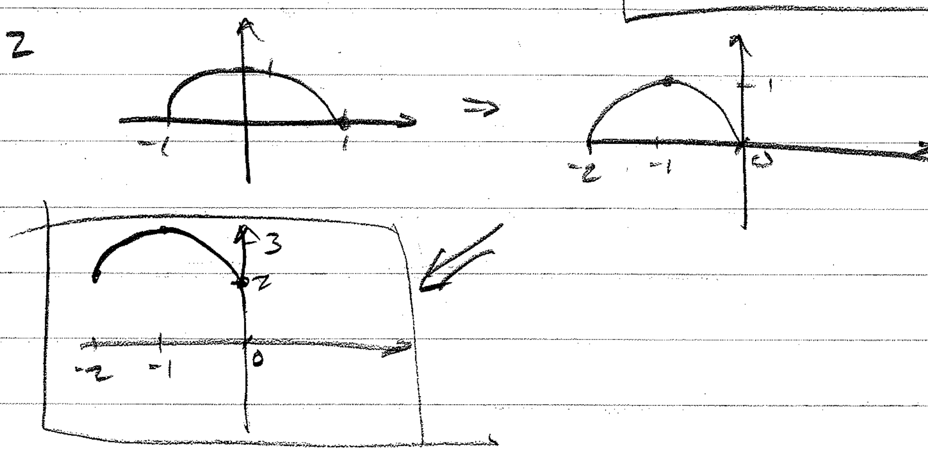
- shift L by 2
- reflect y-axis
- reflect x-axis

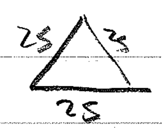


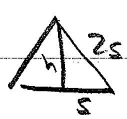
1c) this is $\sqrt{1-(x+1)^2}+2$

start with $\sqrt{1-x^2}$

- shift L by 1
- shift up by 2



2) 

to find height 

$\Rightarrow h^2 + s^2 = (2s)^2$

$\Rightarrow h^2 = 3s^2 \Rightarrow \boxed{h = \sqrt{3}\,s}$

to find Area $A = \frac{1}{2}bh$

$= \frac{1}{2}(2s)\sqrt{3}\,s = \boxed{\sqrt{3}\,s^2}$

3) $f(x) = \frac{2x^3-7}{3x^3+24}$

domain: when is $3x^3+24=0$?

$$3x^3 = -24$$
$$x^3 = -8$$
$$x = -2 \Rightarrow \boxed{\text{Domain: } (-\infty,-2)\cup(-2,\infty)}$$

to find range, do

$$y = \frac{2x^3-7}{3x^3+24} \Rightarrow y(3x^3+24) = 2x^3-7$$
$$\Rightarrow 3x^3y+24y = 2x^3-7$$
$$\Rightarrow 3x^3y-2x^3 = -24y-7$$
$$\Rightarrow x^3(3y-2) = -24y-7$$
$$\Rightarrow x^3 = \frac{-24y-7}{3y-2}$$
$$\Rightarrow x = \sqrt[3]{\frac{-24y-7}{3y-2}}$$

taking cuberoot of neg # is okay, so just need to check for divide by 0

$$3y-2=0 \Rightarrow y = 2/3$$
$$\Rightarrow \boxed{\text{Range: } (-\infty, 2/3)\cup(2/3,\infty)}$$

$$f(2) = \frac{2(8)-7}{3(8)+24} = \frac{9}{48} = \boxed{\frac{3}{16}}$$

$$f(x+2) = \boxed{\frac{2(x+2)^3-7}{3(x+2)^3+24}}$$

4) $D = \sqrt{(x-1)^2+(y-2)^2}$ but $y = x^2$, so

$$\boxed{D = \sqrt{(x-1)^2+(x^2-2)^2}}$$

5. $f(x) = 3x^3 + 4x^2 - x + 4$

a) ARC on $[-1,0]$ is $\frac{f(-1)-f(0)}{-1-0} = \frac{6-4}{-1-0} = \frac{2}{-1} = -2$

$\boxed{\text{so decreasing on average on } [-1,0]}$

ARC on $[-1,2]$ is $\frac{f(2)-f(-1)}{2--1} = \frac{42-6}{3} = \frac{36}{3} = 12$

$\boxed{\text{so increasing on average on } [-1,2]}$

b) $f(x+h) = 3(x+h)^3 + 4(x+h)^2 - (x+h) + 4$

$= 3(x^3+3x^2h+3xh^2+h^3) + 4(x^2+2hx+h^2) - x - h + 4$

$\frac{f(x+h)-f(x)}{h} = \frac{9x^2h+9xh^2+3h^3+8hx+4h^2-h}{h}$

$= \boxed{9x^2+9xh+3h^2+8x+4h-1}$

c) this gives $9x^2+8x-1$, which is the derivative of f (if you have taken calculus...)

6) let t = time since september. My data pts are $(0,500)$, $(1,675)$

thus $m = \frac{675-500}{1-0} = 175$

using point-slope

$y - 500 = 175(x-0)$

$\Rightarrow f(x) = 175x + 500$

In december I guess I make $f(3) = 1025$

percent error $= \frac{|1025-900|}{900} \cdot 100$

$= \frac{125}{900} \cdot 100 = \frac{125}{9}\% \approx 13.9\%$

7 $h(t) = (t-3)^3 + 2$

$y = (t-3)^3 + 2$

$t = (y-3)^3 + 2$

$t - 2 = (y-3)^3$

$\sqrt[3]{t-2} = y - 3$

$\boxed{y = 3 + \sqrt[3]{t-2}} = h^{-1}(t)$

Domain of h is $(-\infty, \infty) \Rightarrow$ Range of h^{-1} is $(-\infty, \infty)$
Domain of h^{-1} is $(-\infty, \infty) \Rightarrow$ Range of h is $(-\infty, \infty)$

8 $g(x) = \sqrt{x-3}$ $\quad f(x) = x - 7$

a) $fg(x) = f(x)g(x) = \boxed{(\sqrt{x-3})(x-7)}$

b) $g \circ f(x) = \sqrt{(x-7)-3} = \boxed{\sqrt{x-10}}$

c) Domain is $x - 10 \geq 0 \Rightarrow \boxed{[10, \infty)}$

note: domain of f is $(-\infty, \infty)$

Range is same as $\sqrt{x}$, which is $\boxed{[0, \infty)}$

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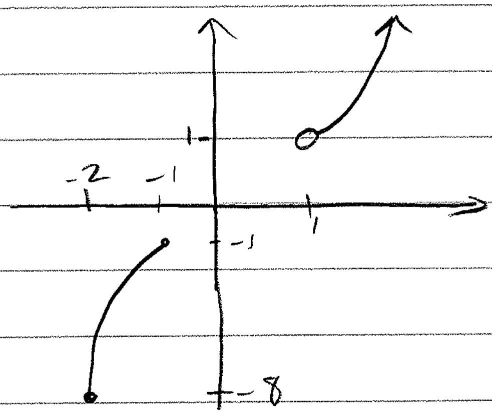

Domain: $[-2, -1] \cup (1, \infty)$
Range: $[-8, -1] \cup (1, \infty)$