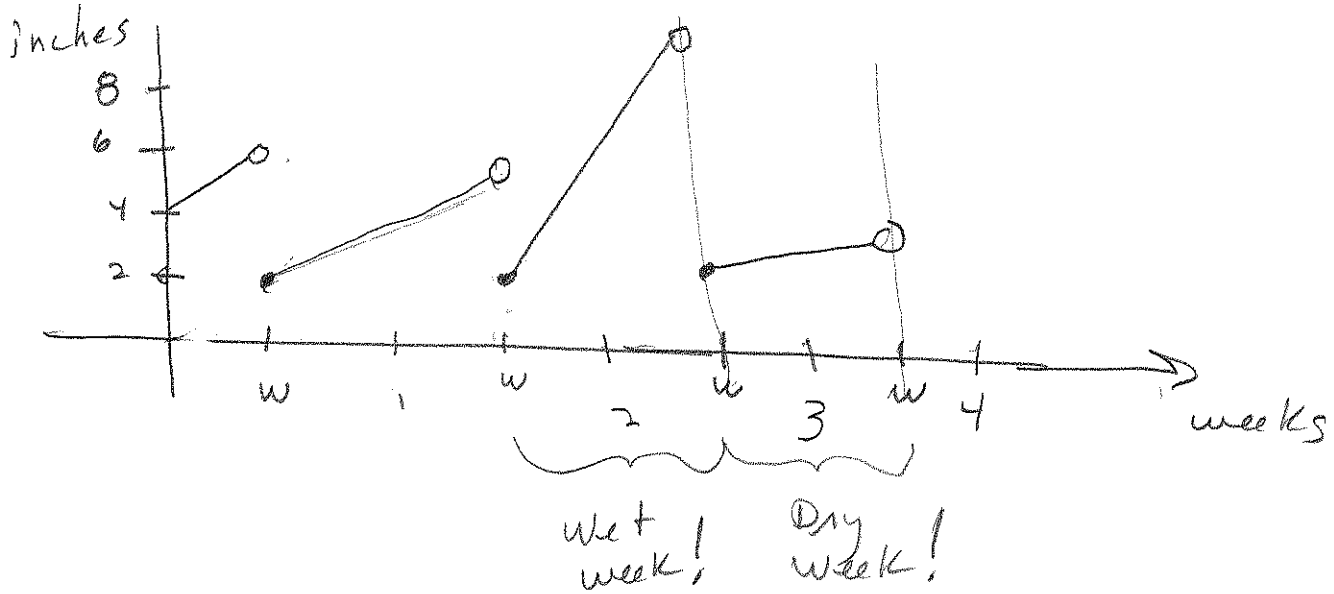
201 §1.1

1 A homeowner mows the lawn once a week, on Wed. Sketch a graph of the grass-height function over 4 weeks.




2 $f(x) = 3x^2 - x + 2 \longrightarrow$

$f(2) = 3(2)^2 - 2 + 2 = \boxed{12 = f(2)}$

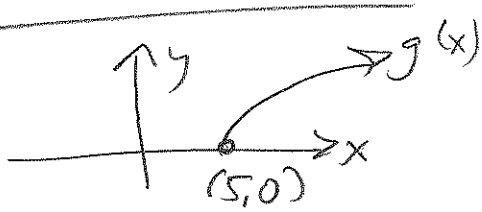
$f(-2) = 3(-2)^2 - (-2) + 2 = 12 + 4 = \boxed{16 = f(-2)}$

$\boxed{f(a) = 3a^2 - a + 2}$

$f(-a) = 3(-a)^2 - (-a) + 2 = 3a^2 + a + 2 = f(-a)$

$f(a+1) = 3(a+1)^2 - (a+1) + 2 = 3(a^2+2a+1) - a - 1 + 2$

$= 3a^2 + 6a + 3 - a + 1 = \boxed{3a^2 + 5a + 4 = f(a+1)}$




Find $\mathcal{D}$ & sketch

3 $g(x) = \sqrt{x-5} \longrightarrow \mathcal{D}(g) = \{x \mid x - 5 \geq 0\}$

$= \boxed{\{x \mid x \geq 5\} = [5, \infty) = \mathcal{D}(g)}$

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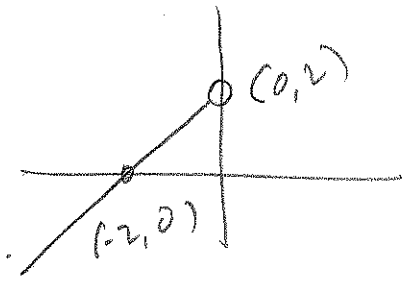
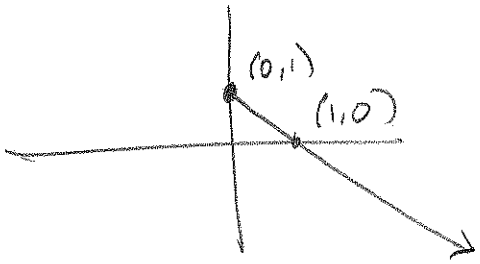
4 $f(x) = \begin{cases} x+2 & \text{if } x < 0 \\ 1-x & \text{if } x \geq 0 \end{cases}$

$\mathcal{D}(f) = \mathbb{R}$

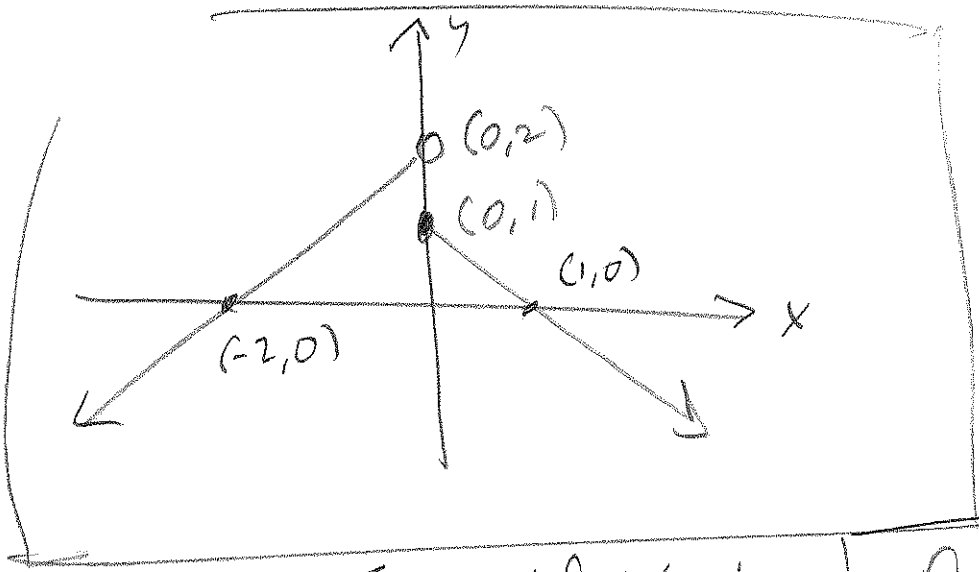



$x+2, \; x<0$



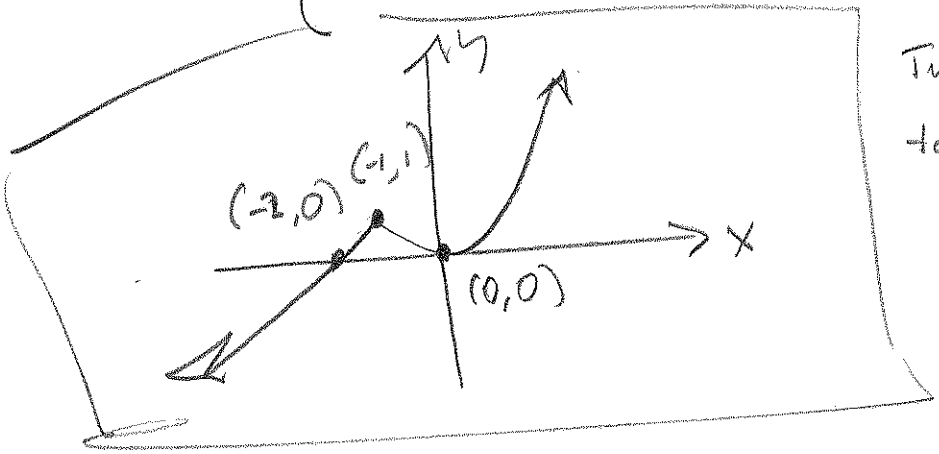

$1-x, \; x \geq 0$

combine:




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

$\mathcal{D} = \mathbb{R}$




Two pieces actually touch.

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Find an expression for the function whose graph is the given curve.

6 Line SEGMENT from $(1,-3)$ to $(5,7)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{7-(-3)}{5-1} = \frac{10}{4} = \frac{5}{2} = m$$

$y = m(x - x_1) + y_1$

$y = \frac{5}{2}(x-1) - 3$ or $y = \frac{5}{2}(x-5) + 7$

$y = \frac{5}{2}x - \frac{11}{2}$

Need $1 \le x \le 5$ in your answer

7 The bottom $\frac{1}{2}$ of the parabola

$x + (y-1)^2 = 0 \longrightarrow$

$(y-1)^2 = -x \longrightarrow$

$y - 1 = \pm\sqrt{-x} \longrightarrow$

$y = 1 \pm \sqrt{-x} \longrightarrow$

$y = \pm\sqrt{-x} + 1 \longrightarrow$

$y = -\sqrt{-x} + 1$ ∴ bottom half.

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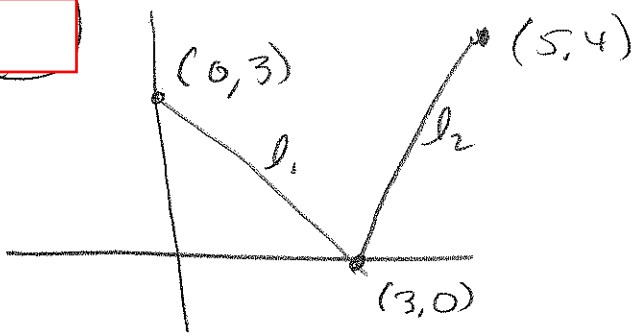



$l_1$: $m = \frac{0-3}{3-0} = \frac{y_2-y_1}{x_2-x_1}$

$= \frac{-3}{3} = -1$

$l_1$: $y = -1(x-0)+3$

$l_2$: $m = \frac{y_2-y_1}{x_2-x_1} = \frac{4-0}{5-3} = \frac{4}{2} = 2$

$l_2$: $y = 2(x-3)+0$

I've built the two pieces, but it doesn't appear I took it quite to the finish line. Still need to write the piece-wise definition, formally. Here ya go:

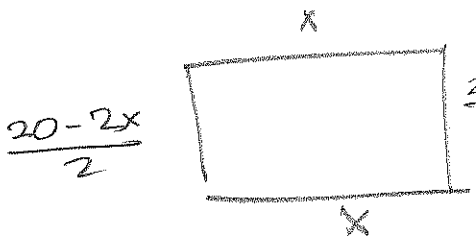
$$f(x)=\begin{cases}-(x-0)+3 & 0\le x\le 3\\ 2(x-3) & 0<x\le 5\end{cases}$$ If you're stuck on slope-intercept form, then

$$f(x)=\begin{cases}-x+3 & 0\le x\le 3\\ 2x-6 & 3<x\le 5\end{cases}$$ or $$f(x)=\begin{cases}-x+3 & 0\le x<3\\ 2x-6 & 3\le x\le 5\end{cases}$$, since the pieces touch at $x=3$

Find a formula for function described & state its domain.

9

Rect. w/ Perimeter = P = 20 m, Express its area as func. of one of its sides




$A(x) = x(10-x)$

$D = (0, 10)$

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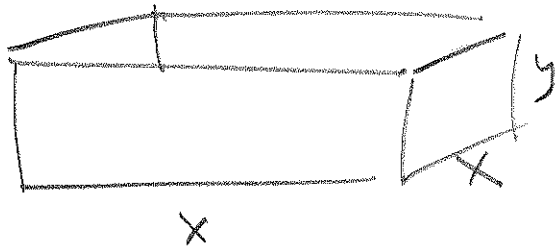
10 An open rect. box with vol $2\ m^3$ has a square base. Express the surface area as func. of length of a side. open top.



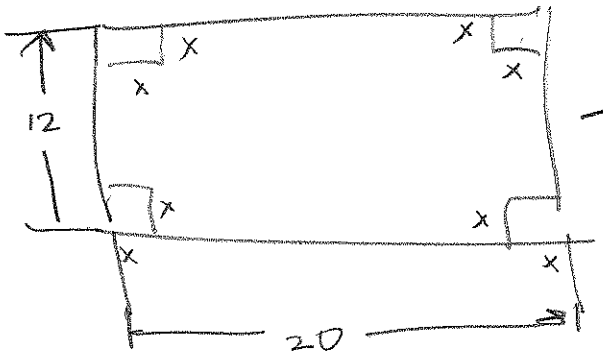

$x^2 y = 2 \Rightarrow y = \frac{2}{x^2}$

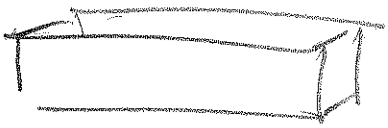
Volume.

Area: $x^2 + 4xy = x^2 + 4x\left(\frac{2}{x^2}\right) \Rightarrow$

$$A(x) = x^2 + \frac{8}{x}$$

11 Box w/ open top from piece of cardboard 12 in x 20 in. Cut out equal squares, x inches from 4 corners & fold.



Express volume as $V(x)$

$$V = x^2(20-2x)(12-2x)$$

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Determine whether $f$ is even, odd or neither.

12 $f(x) = \frac{x}{x^2+1}$ is odd, b/c

$f(-x) = \frac{-x}{(-x)^2+1} = -\frac{x}{x^2+1} = -f(x)$ ✓

13 $f(x) = 1 + 3x^2 - x^4$ is even, bc

$f(-x) = 1 + 3(-x)^2 - (-x)^4 = 1 + 3x^2 - x^4 = f(x)$ ✓