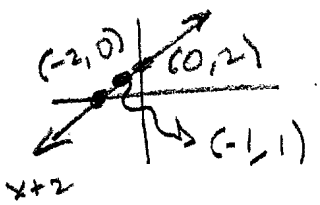
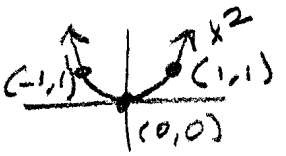
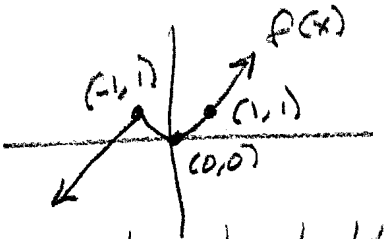
MAT 201 § 1.1 II #s 43, 48, 50, 53, 57, 64, 68

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







Cool, the two pieces touch at the suture point!

~~#s~~ 45-50: Find an expression for the function whose graph is the given curve

(48) The top half of the circle $x^2 + (y-2)^2 = 4$

$(y-2)^2 = 4 - x^2$

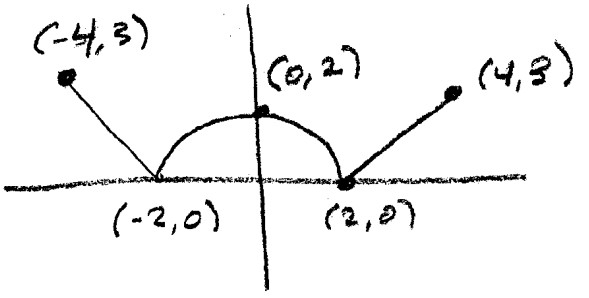
$y - 2 = \pm\sqrt{4-x^2}$

$y = 2 \pm \sqrt{4-x^2}$

Want top half:

$y = 2 + \sqrt{4-x^2}$

(50)



Conclusion:

$$f(x) = \begin{cases} -\frac{3}{2}x - 3 & \text{if } -4 \le x \le -2 \\ \sqrt{4-x^2} & \text{if } -2 < x \le 2 \\ \frac{3}{2}x - 3 & \text{if } 2 < x \le 4 \end{cases}$$

$-4 \le x \le -2$:

$(-4,3)$ & $(-2,0)$ on the line segment:

$m = \frac{3-0}{-4+2} = \frac{3}{-2}$

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

$y = -\frac{3}{2}(x-(-2)) + 0$

$y = -\frac{3}{2}x - 3$

$-2 \le x \le 2$:

Top half of circle:

$x^2 + y^2 = 2^2$

$y^2 = 4 - x^2$

$y = \pm\sqrt{4-x^2}$

$y = \sqrt{4-x^2}$

$2 \le x \le 4$:

$(2,0)$ & $(4,3)$ on the line segment

By symmetry:

$y = \frac{3}{2}x - 3$

MAT 201 §1.1 II #s 28, 31, 37, 43, 48, 50, 53, 57, 64, 68

#s 27–31 Find the domain of the function

(28) $f(x) = \dfrac{5x+4}{x^2+3x+2}$. We need $x^2+3x+2 \neq 0$

$\Rightarrow (x+2)(x+1) \neq 0$

$\Rightarrow x \neq \pm 1$

$\Rightarrow \mathcal{D} = \mathbb{R} \setminus \{\pm 1\}$

OR $\{x \mid x \neq \pm 1\}$

OR $(-\infty, -1) \cup (-1, 1) \cup (1, \infty)$

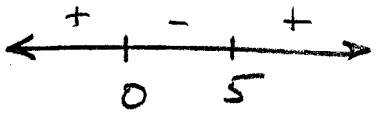
(31) $h(x) = \dfrac{1}{\sqrt[4]{x^2-5x}}$. 4 is even: Need $x^2-5x \geq 0$

Also, $\sqrt[4]{x^2-5x}$ is in denominator: Need $\sqrt[4]{x^2-5x} \neq 0$.

These two concerns reduce to: Need $x^2-5x > 0$:

$x(x-5) > 0$

$x = 0, 5$!



Scratch:

$(-\infty, 0)$: $x = -1$ $(-1)^2 - 5(-1) = 6 +$

$(0, 5)$: $x = +1$ $1^2 - 5(1) = -4 -$

$(5, \infty)$: $x = 6$ $6^2 - 5(6) = 6 +$

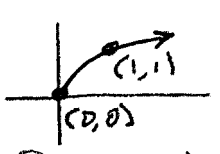
Conclusion: $\mathcal{D} = (-\infty, 0) \cup (5, \infty)$

OR $\{x \mid x < 0 \text{ OR } x > 5\}$

#s 33–44; Find domain & sketch the graph

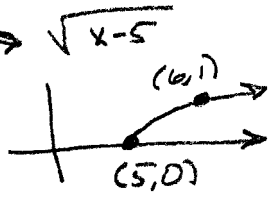
(37) $g(x) = \sqrt{x-5}$

$\sqrt{x} \longrightarrow \sqrt{x-5}$



$\mathcal{D} = [0, \infty)$

$\mathcal{R} = [0, \infty)$

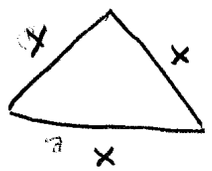


$\mathcal{D} = [5, \infty)$

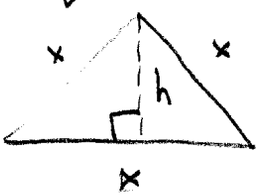
$\mathcal{R} = [0, \infty)$

MAT 201 §1.1 II #s 53, 57, 64, 68

(53) Express the area of an equilateral triangle as a function of the length of a side.



Area $= \frac{1}{2}bh$
$= \frac{1}{2}xh$



Need h: $h^2 + \left(\frac{x}{2}\right)^2 = x^2$

$h^2 = x^2 - \frac{x^2}{4} = \frac{3x^2}{4}$

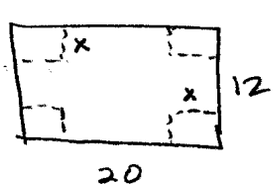
$h = \pm\sqrt{\frac{3x^2}{4}} = \pm\frac{\sqrt{3}\,x}{2}$

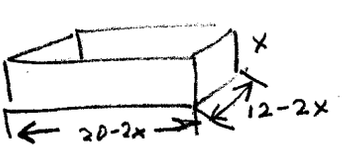
Take h positive.

$\text{Area} = \frac{1}{2} x \cdot \frac{\sqrt{3}\,x}{2}$

$= \boxed{\frac{\sqrt{3}\,x^2}{4} = \text{Area}}$

(57) Box with open top from cardboard rectangle that is 12 in by 20 in. We cut out equal squares of side length x & then fold up the edges. Express volume V as function of x.



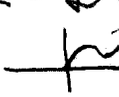


volume = length · width · height

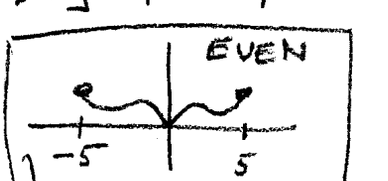
$= (20-2x)(12-2x)x$

$= V(x)$ in cubic inches

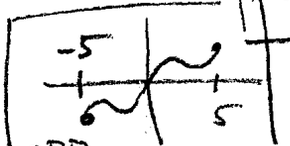
(64) A function f has domain = $\mathcal{D}(f) = [-5, 5]$ & a portion of its graph is shown:



(a) Complete the graph if f is even.



(b) Same for if f is odd.



(68) Is $f(x) = x|x|$ odd, even, or neither?

$f(x) = \begin{cases} x^2 \text{ if } x \geq 0 \\ -x^2 \text{ if } x < 0 \end{cases}$; is odd.

Piecewise approach.

$f(-x) = -x|-x| = -x|x| = -f(x)$

Basic defin of odd/even.

f is odd