Inequalities & Absolute values.

(1) $2 - x \geq 4$

$-2 \qquad -2$

$(-1)\ -x \geq 2\ (-1)$

$x \leq -2$

sign flips when multiplying/dividing by a negative

$\boxed{(-\infty, -2]}$

(2) $|2x+3| > 5$

Assuming $2x+3>0$ ...

$2x+3>5$

$-3 \quad -3$

$(\tfrac{1}{2})\ 2x > 2\ (\tfrac{1}{2})$

$x > 1$

Assuming $2x+3<0$ ...

$2x+3<-5$

$-3 \quad -3$

$(\tfrac{1}{2})\ 2x < -8\ (\tfrac{1}{2})$

$x < -4$

$\boxed{(-\infty, -4) \cup (1, \infty)}$

Lines.

(3) Compute the slope-intercept form of the line that passes through the pts $(-1,3)$ & $(5,4)$.

$$m = \frac{4-3}{5-(-1)} = \frac{1}{6}$$

$$y = \frac{1}{6}x + b$$

$$3 = \frac{1}{6}(-1) + b$$

$$\boxed{y = \frac{1}{6}x + \frac{19}{6}}$$

$$3 = -\frac{1}{6} + b$$

$$\frac{19}{6} = b$$

(4) Compute a line that is perpendicular to the one above that passes through the pt $(3,1)$.

$$m = -6 \Rightarrow y = -6x + b$$

$$1 = -6(3) + b$$

$$1 = -18 + b$$
$$19 = b$$

$$\boxed{y = -6x + 19}$$

Parabolas.

(5) Compute the vertex & zeros of the parabola $y = -x^2 - 3x - 2$.

zeros: $x = \dfrac{3 \pm \sqrt{9-8}}{-2} = \dfrac{3 \pm 1}{-2}$

$$\boxed{x = -2, -1}$$

Fact: the x-coordinate of the vertex is the average of the two zeros

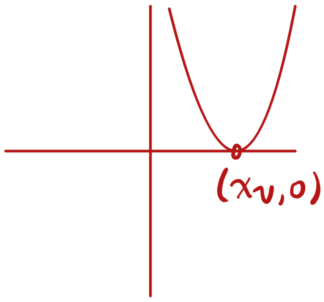
$$x_v = \frac{1}{2}(-1 + (-2)) = \frac{-3}{2}$$

$$\boxed{\left(\frac{-3}{2}, \frac{1}{4}\right)}$$

$$y_v = -\left(\frac{-3}{2}\right)^2 - 3\left(\frac{-3}{2}\right) - 2$$

$$= -\frac{9}{4} + \frac{9}{2} - 2 = \frac{-9}{4} + \frac{18}{4} - \frac{8}{4} = \frac{1}{4}$$

(6) Give an example of a parabola whose vertex is also a zero.



$y = a(x-h)^2 + k$

$k = 0$!

$y = a(x-h)^2$

any parabola of this form will work...

$$\boxed{y = x^2}$$

Polynomials.

(7) Let $p(t) = t^2 - 1$ let $q(t) = 3t^3 - t + 3$. What is $\deg(p+q)$?

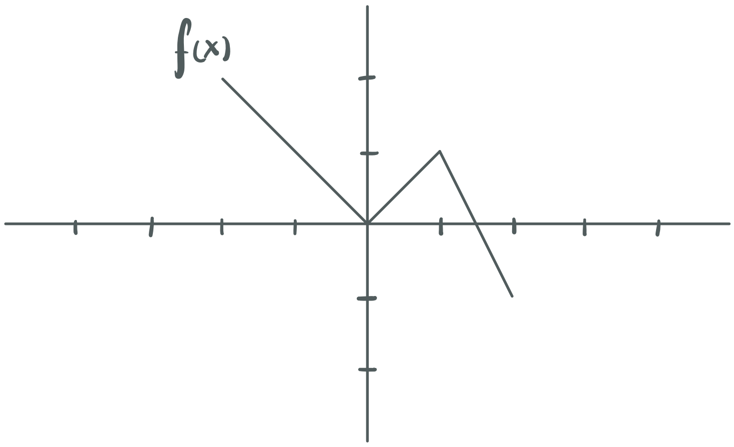
$$p(t) + q(t) = t^2 - 1 + 3t^3 - t + 3$$

$$= 3t^3 + t^2 - t + 2$$

$$\boxed{\deg(p+q) = 3}$$

Function transformations.

(8) The function $f(x)$ has the domain $[-2,2]$ and is depicted below.



Sketch the following functions...

(a) $g(x) = f(\frac{1}{2}x) + 1$

(1) horizontal stretch by 2

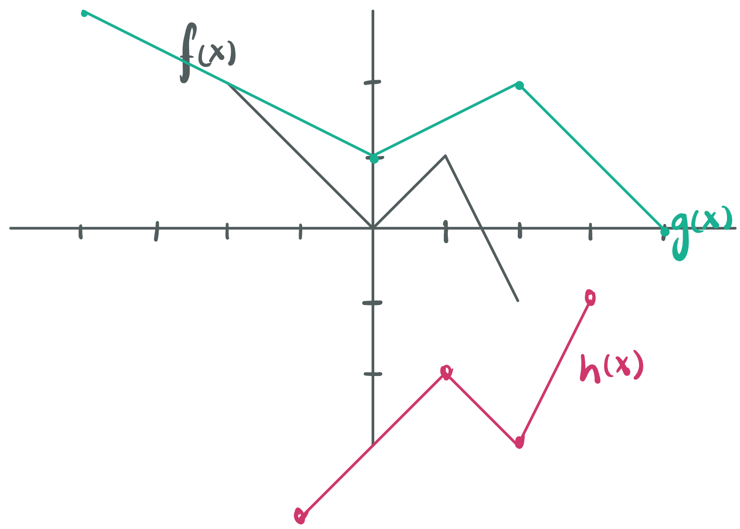
(2) vertical shift up 1

(b) $h(x) = -f(x-1) - 2$

(1) horizontal shift right 1

(2) flip across x-axis

(3) vertical shift down 2


f(x)
g(x)
h(x)