Station 1

- Find the equation of a LINEAR FUNCTION given : $f(\overset{x}{2}) = \overset{y}{5}$ and $f(\overset{x}{-1}) = \overset{y}{3}$

$y = mx + b$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3-5}{-1-2} = \frac{-2}{-3} = \frac{2}{3}$

$y = \frac{2}{3}x + b$

plug in any point $(2,5)$ or $(-1,3)$ into x, y
and solve for b.

$y = \frac{2}{3}x + \frac{11}{3}$

$5 = \frac{2}{3}(2) + b$

$5 = \frac{4}{3} + b$

$-\frac{4}{3} \quad -\frac{4}{3}$

$b = \frac{5^{\cdot 3}}{1 \cdot 3} - \frac{4}{3} = \frac{15-4}{3} = \frac{11}{3}$

Station 2

Given $g = 2x^2 + 5x + 6$ ← y-intercept.

- Find: the vertex, axis of symmetry and y intercept of the quadratic function then rewrite it in vertex form

vertex (h, k) $\quad h = -\frac{b}{2a} = \frac{-5}{4}$ ← plug it in for x to find K

$= 2\left(-\frac{5}{4}\right)^2 + 5\left(-\frac{5}{4}\right) + 6$

$= \cancel{2}^{1} \cdot \frac{25}{\cancel{16}_{8}} - \frac{25}{4} + 6$

$= \frac{25}{8} - \frac{25 \cdot 2}{4 \cdot 2} + \frac{6 \cdot 8}{1 \cdot 8}$

$K = \frac{25}{8} - \frac{50}{8} + \frac{48}{8} = \frac{73-50}{8} = \frac{23}{8}$

vertex

$\left(-\frac{5}{4}, \frac{23}{8}\right)$

axis of symmetry

$x = h$

$\boxed{x = \frac{-5}{4}}$

vertex form

$2\left(x + \frac{5}{4}\right)^2 + \frac{23}{8}$

Station 3

- List the zeros and their multiplicity for the given functions, then graph them and compare their graphs

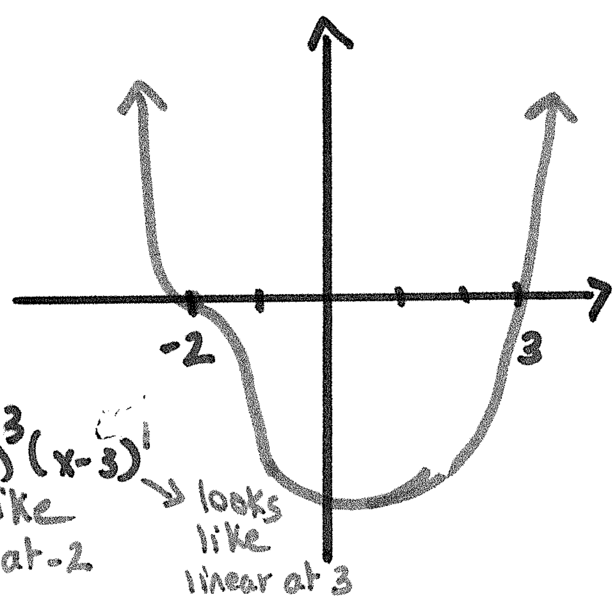
Both Quartic
shape

$$\begin{cases} f(x) = (x+2)^3(x-3)^1 \\ g(x) = (x+2)^2(x-3)^2 \end{cases}$$

zeros

-2 multiplicity of 3
3 no multiplicity

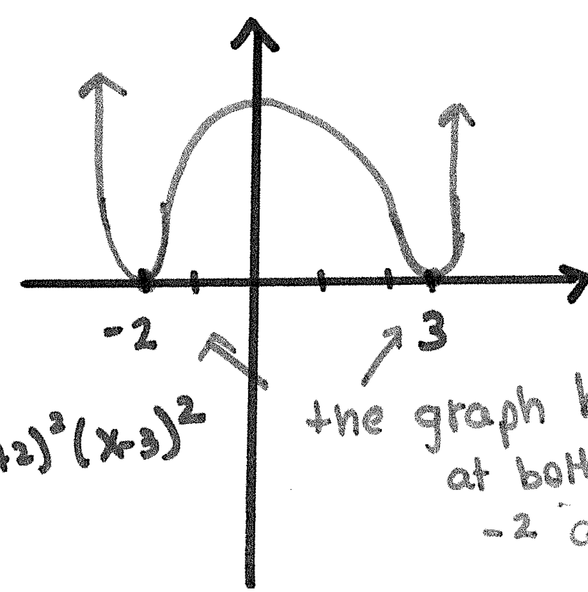
-2 multiplicity of 2
3 multiplicity of 2



$(x+2)^3(x-3)^1$

looks like a cubic at -2

looks like linear at 3



$(x+2)^2(x-3)^2$

the graph bounces at both zeros -2 and 3

Station 4

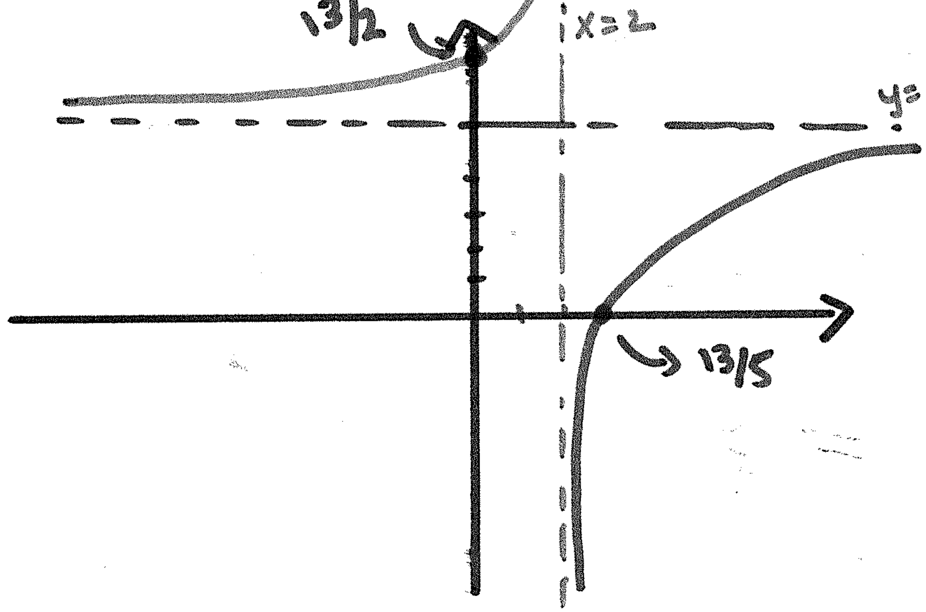
V.A $x=2$
H.A $y=5$
x-int $13/5$
y int $13/2$

Graph the following function:

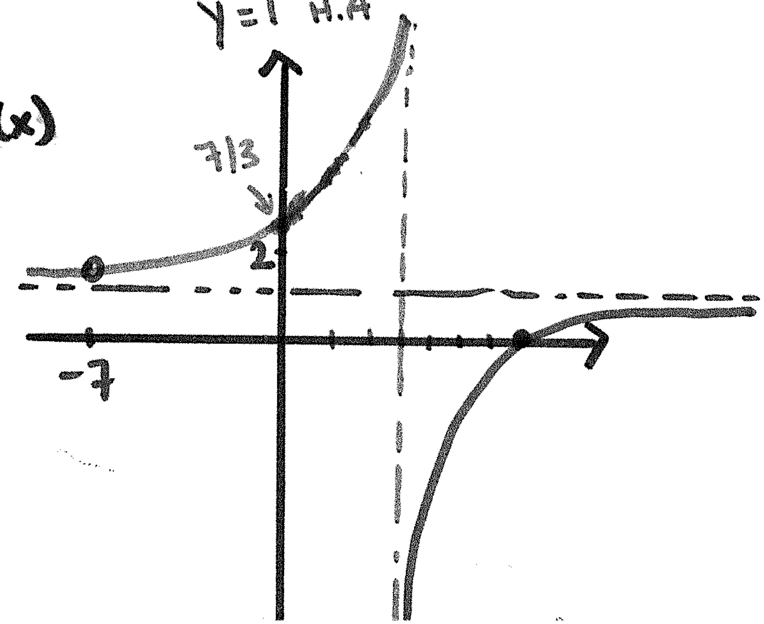
- $f(x) = \frac{5}{1}\frac{(x-2)}{(x-2)} - \frac{3}{x-2} = \frac{5x-10}{x-2} - \frac{3}{x-2} = \frac{5x-13}{x-2}$
- $g(x)=\frac{x^2-49}{x^2+4x-21} = \frac{(x-7)(x+7)}{(x-3)(x+7)}$

hole at -7
V.A $x=3$
x-int $x=7$
y int $y=7/3$
$y=1$ H.A

f(x)



g(x)



Station 5 (use 2 different methods)

- Factor the Polynomial into its linear factors:

$$x^3 + 2x^2 - x - 2$$

Factor by grouping

$x^3 + 2x^2 - x - 2$

$= x^2(x+2) - 1(x+2)$

$= (x+2)(x^2-1)$

$= (x+2)(x-1)(x+1)$

Rational zero theorem

Factors of 2 : $\pm 1, \pm 2$

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

$= -8 + 8 + 2 - 2$

$f(-2) = 0$

$$\begin{array}{r|rrrr} -2 & 1 & 2 & -1 & -2 \\ & & -2 & 0 & 2 \\ \hline & 1x^2 & 0 & -1 & 0 \end{array}$$

$(x+2)(x^2-1)$

$(x+2)(x-1)(x+1)$

Station 6

- Use the remainder theorem to find the remainder when $f(x)$ is divided by $x - k$ then explain whether $x - k$ is a factor or not

$f(x) = x^3 - x^2 - x - 15$, $K = 3$

$f(3) = 3^3 - 3^2 - 3 - 15$

$= 27 - 9 - 3 - 15 = 0$

then $x-3$ is a factor of $f(x)$

Station 7

- Find all of the real zeros of the given function. Identify each zero as rational or irrational.

$f(x) = x^4 - x^3 - 7x^2 + 5x + 10$

given (x+1) and (x-2) are factors of f(x)

Hint use synthetic division twice

$$\begin{array}{r|rrrrr} -1 & 1 & -1 & -7 & 5 & 10 \\ & \downarrow & -1 & 2 & 5 & -10 \\ \hline & 1x^3 & -2x^2 & -5x & 10 & 0 \end{array}$$

$$\begin{array}{r|rrrr} 2 & 1 & -2 & -5 & 10 \\ & \downarrow & 2 & 0 & -10 \\ \hline & 1x^2 & 0 & -5 & 0 \end{array}$$

$f(x) = \underbrace{(x+1)(x-2)}_{\text{given factors}}\underbrace{(x^2-5)}_{(x-\sqrt{5})(x+\sqrt{5})}$

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

zeros $\underbrace{-1, 2}_{\text{rational zeros.}}, \underbrace{\sqrt{5}, -\sqrt{5}}_{\text{irrational zeros}}$

Station 8

- Describe the end behavior of the following function. Use complete sentences and limit notation:

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

odd degree
negative leading coefficient } up, down

$\lim_{x \to \infty} f(x) = -\infty$ down

right

$\lim_{x \to -\infty} f(x) = \infty$ up

left