$$\left(x - \tfrac{1}{2}y - \tfrac{1}{3}z = -\tfrac{4}{3}\right)(6) \longrightarrow 6x - 3y - 2z = -8$$

$$(\cancel{6}^{2})(-\tfrac{4}{\cancel{3}}) = -8$$

$$\left(\tfrac{1}{3}x \quad - \tfrac{1}{2}z = 5\right)(6) \longrightarrow 2x \quad -3z = 30$$

$$\left(-\tfrac{1}{4}x + \tfrac{2}{3}y - z = -\tfrac{3}{4}\right)(12) \longrightarrow -3x + 8y - 12z = -9$$

E2 says $2x = 3z + 30$ Send to E1 & E3

$$x = \frac{3z+30}{2}$$

E1 $$\left(\cancel{6}^{3}\left(\frac{3z+30}{\cancel{2}}\right) - 3y - 2z = -8\right)(2)$$

Didn't need to clear fracs. The '2' cancels with the '6'.

$$6(3z+30) - 6y - 4z = -16$$

$$18z + 180 - 6y - 4z = -16$$

$$-6y + 14z = -196$$

E1 $-3y + 7z = -98$

E3 $$\left(-3\left(\frac{3z+30}{2}\right) + 8y - 12z = -9\right)(2)$$

$$-3(3z+30) + 16y - 24z = -18$$

$$-9z - 90 + 16y - 24z = -18$$

E3 $16y - 33z = 72$

E1 $-3y + 7z = -98$

E3 $16y - 33z = 72$

E1 says $-3y + 7z = -98$

$$-3y = -7z - 98$$

$$y = \frac{-7z-98}{-3} = \frac{7}{3}z + \frac{98}{3}$$

send to E3

$$\left(16\left(\frac{7z+98}{3}\right) - 33z = 72\right)(3)$$

$$16(7z+98) - 99z = 216$$

$$112z + 1568 - 99z = 216$$

$$\begin{array}{r} -1568 \\ +216 \\ \hline -1352 \end{array}$$

$$13z = -1352$$

$$z = \frac{-1352}{13} = \boxed{-104 = z}$$

$$y = \frac{7(-104)+98}{3} = -\frac{630}{3} = \boxed{-210 = y}$$

$$x = \frac{3z+30}{2} = \frac{3(-104)+30}{2} = \boxed{-141 = x}$$

$$\boxed{(x, y, z) = (-141, -210, -104)}$$

Discriminant

b^2-4ac $\quad ax^2+bx+c=0$

$=0$ 1 solution

<0 2 nonreal solutions

>0 2 real solutions

= a perfect square 2 rational solutions. (It factors!)

$\sqrt{-3}$ ain't real.

Quadratic Formula

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

x^2+2x-3

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

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

x^2+2x-3

$a=1,\ b=2,\ c=-3$

$b^2-4ac = 2^2-4(1)(-3) = 4+12=16$

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a} = \frac{-2\pm\sqrt{16}}{2(1)} = \frac{-2\pm 4}{2}$$

$\frac{2}{2}=1$

$-\frac{6}{2}=-3$

$x=1,\ x=-3$ are zeroes.

This means $(x-1), (x-(-3))$ are factors!

$x^2+2x-3=(x-1)(x+3)$ Sweet!

Write in lowest terms.

$$\frac{x^2+x-6}{x^2+2x-3} = \frac{(x+3)(x-2)}{(x+3)(x-1)} = \boxed{\frac{x-2}{x-1} \qquad (x \neq -3)}$$

Domain: $\frac{\text{stuff}}{0}$ is bad

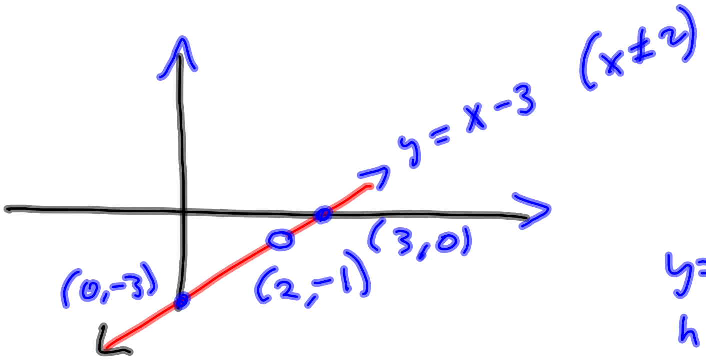
$$\mathcal{D} = \{x \mid x \neq 1 \text{ and } x \neq -3\}$$

$x+3=0$
$x=-3$ Bad

$x-1=0$
$x=1$ Bad

$$\frac{x^2-5x+6}{x-2} = \frac{(x-2)(x-3)}{(x-2)} = \boxed{x-3 \quad (x \neq 2)}$$

$y = \frac{x^2-5x+6}{x-2}$ is exactly like $y=x-3$, only it has a hole @ $x \neq 2$



Plug $x=2$ into $y=x-3$ to find the hole: $2-3=-1$

Special Products

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

$$x^3-y^3=(x-y)(x^2+xy+y^2)$$

$$x^3+y^3=(x+y)(x^2-xy+y^2)$$

$x^2+y^2 =$ Does not factor.

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

$$= x^2-i^2y^2 = (x-(iy))(x+(iy))$$

$$= x^2-(iy)^2 =$$

Not tested on.

Did you know $4 - x = -(x-4)$

$$-1\left(\frac{4}{-1} - \frac{x}{-1}\right) = -1(-4+x)$$

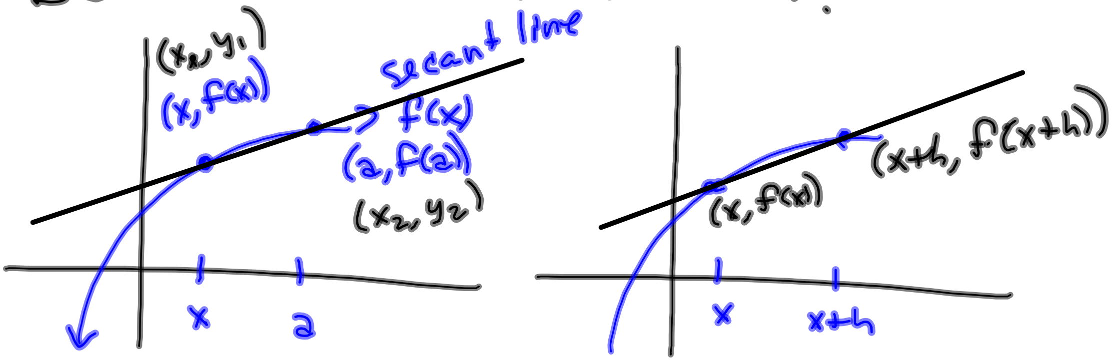
$$= -(x-4)$$

$$\frac{x-4}{4-x} = \frac{x-4}{-(x-4)} = \frac{1}{-1} = -1$$

$$\frac{x^2 - 3ax - 2x + 6a}{x^2 - 3ax + 2x - 6a} = \frac{x(x-3a) - 2(x-3a)}{x(x-3a) + 2(x-3a)}$$

$$= \frac{(x-3a)(x-2)}{(x-3a)(x+2)} = \boxed{\frac{x-2}{x+2}} \quad (x \neq 3a)$$

§5.1 #s 55-64 Pictures!



$$m = \frac{f(a) - f(x)}{a - x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{f(x) - f(a)}{x - a}$$

= average slope of $f(x)$ between x & a.

$$= \frac{f(x+h) - f(x)}{h}$$

In calc, they let $h \longrightarrow 0$ & they let $x \longrightarrow a$

#62 $f(x) = x^2 - 3$

(a) $\dfrac{f(x) - f(a)}{x-a} = \dfrac{x^2 - 3 - (a^2 - 3)}{x-a}$

$= \dfrac{x^2 - 3 - a^2 + 3}{x-a} = \dfrac{x^2 - a^2}{x-a} = \dfrac{(x-a)(x+a)}{x-a} = \boxed{x+a}$ $(x \neq a)$

Let $a \to x$

This becomes ... $2x$

(b) $\dfrac{f(x+h) - f(x)}{h} = \dfrac{(x+h)^2 - 3 - (x^2 - 3)}{h}$

$= \dfrac{x^2 + 2xh + h^2 - 3 - x^2 + 3}{h} = \dfrac{2xh + h^2}{h} = \dfrac{\cancel{h}(2x+h)}{\cancel{h}}$

$= \boxed{2x+h}$ $h \to 0$ makes it $2x$

Difference Quotient

$\dfrac{f(x+h) - f(x)}{h}$, $\dfrac{f(x) - f(a)}{x-a}$

Summarize our Progress.

Get 4.1, 4.2 to me by Friday.

BH 134K

4.3, 4.4 Friday 50% Bonus

5.1 " 100% "