

Feb. 8, 2017

a) $8x^3 - 27$

$(2x)^3 - (3)^3$ $\hookrightarrow (x-y)(x^2+xy+y^2)$

$= (2x - 3)(4x^2 + 6x + 9)$

$b^2 - 4ac < 0$ no roots

$36 - 4(4)(9)$

$36 - 108$

$= \boxed{-72}$

Diff. of Cubes

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

Sum. of Cubes

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

b) Graph

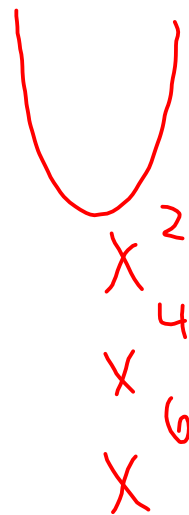
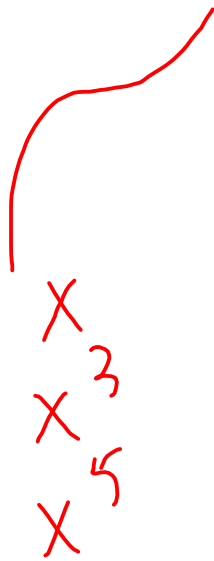
$$f(x) = 2x^3 - 5x^2 + x + 2$$

using roots, y-int and

end behaviour

y-int: (0, 2)

end. behaviour



as $x \rightarrow \infty, y \rightarrow \infty$

$x \rightarrow -\infty, y \rightarrow -\infty$

$$f(1) = 2(1)^3 - 5(1)^2 + (1) + 2$$

$$= 2 - 5 + 1 + 2$$

$$f(1) = 0$$

$\therefore (x-1)$ is a factor

$$\begin{array}{r}
 2x^2 - 3x - 2 \\
 \hline
 x - 1 \mid 2x^3 - 5x^2 + x + 2 \\
 \underline{-2x^3 - 2x^2} \quad \downarrow \\
 -3x^2 + x \\
 \underline{-3x^2 + 3x} \quad \downarrow \\
 -2x + 2 \\
 \underline{-2x + 2} \\
 0
 \end{array}$$

$$f(x) = (x-1)(2x^2 - 3x - 2)$$

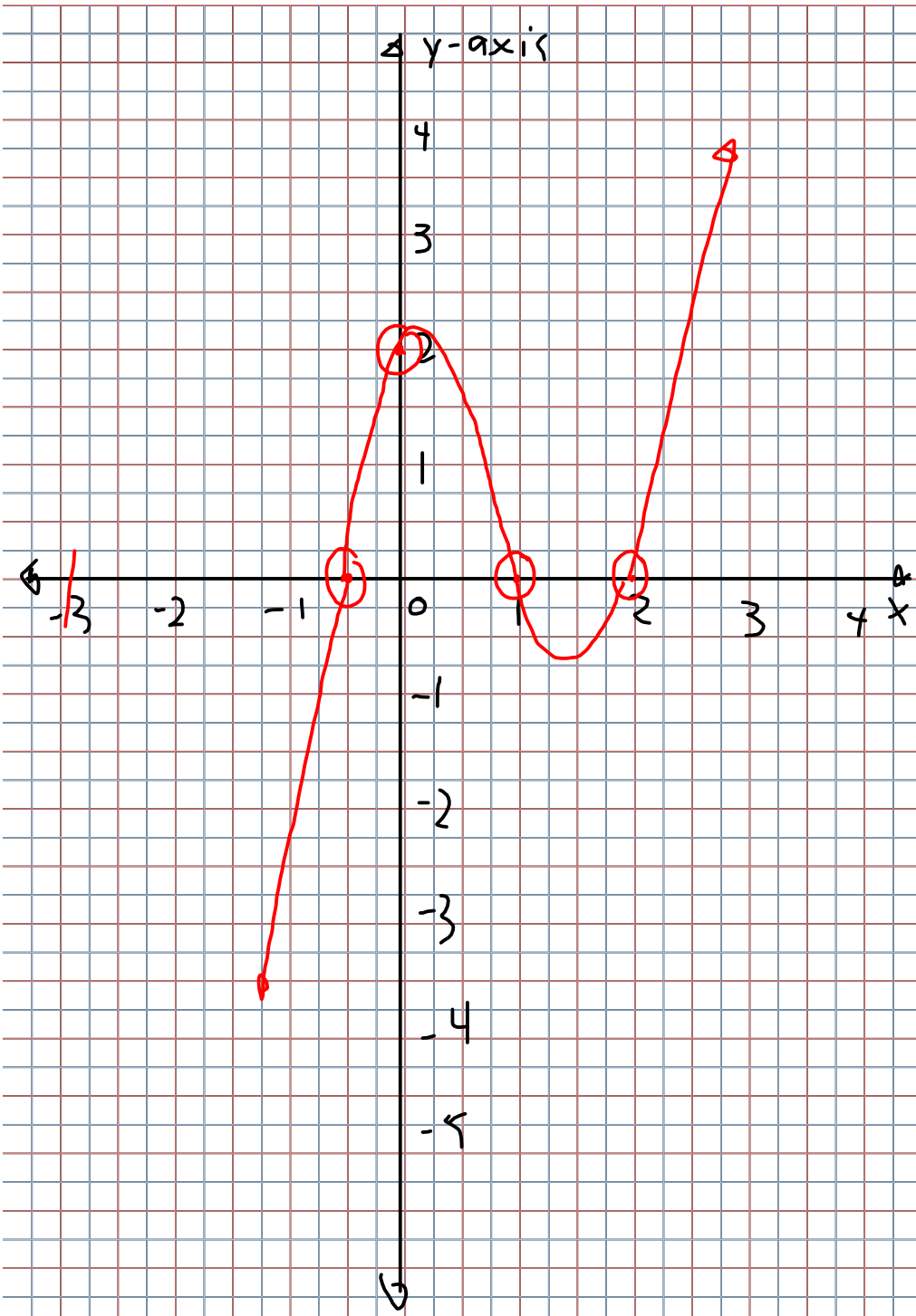
$$m: -4 \\ a: -3 - 4 + 1$$

$$= (x-1)(2x^2 - 4x + x - 2)$$

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

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

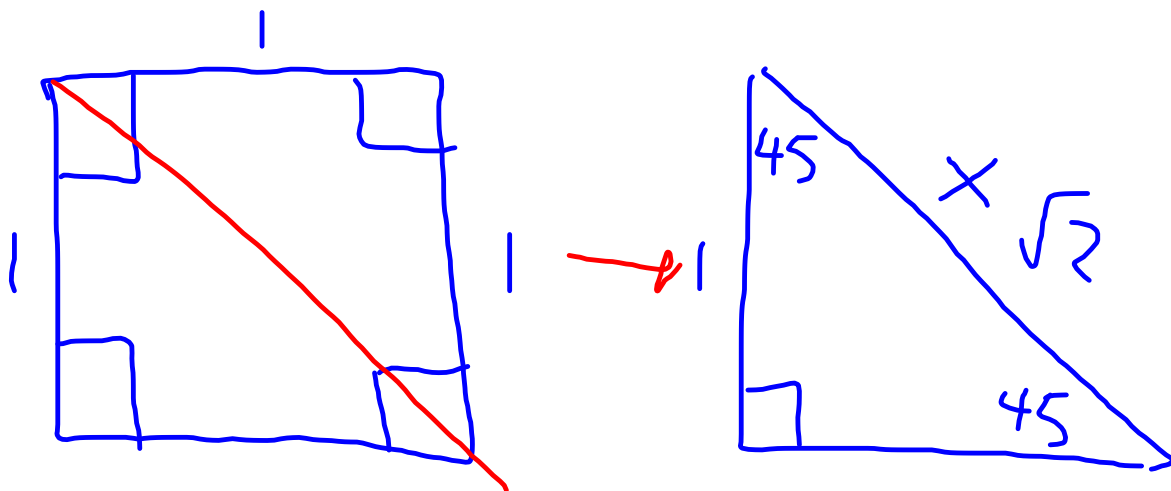
$$x = 1 \quad x = 2 \quad x = -\frac{1}{2}$$



Grade 9-12 Review

$\frac{\pi}{4} - \frac{\pi}{4} - \frac{\pi}{2}$ Triangle

aka (45-45-90)



$$1^2 + 1^2 = x^2$$

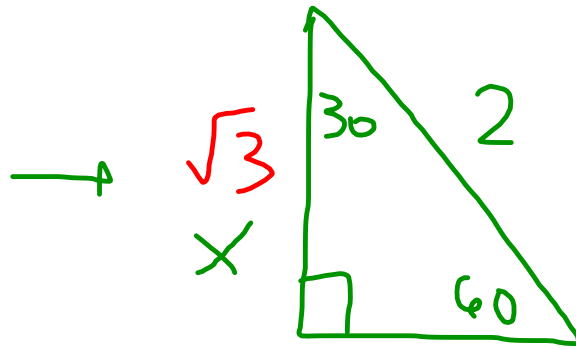
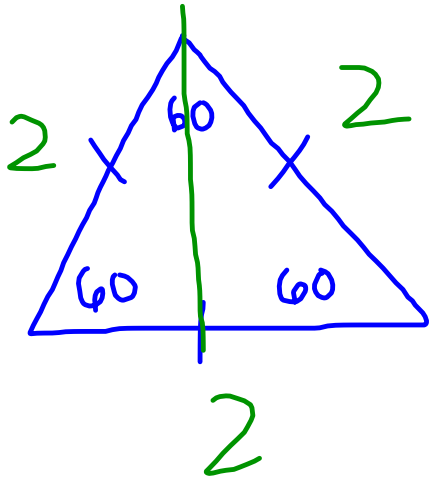
$$1 + 1 = x^2$$

$$2 = x^2$$

$$\boxed{x = \sqrt{2}}$$

$\frac{\pi}{6} - \frac{\pi}{3} - \frac{\pi}{2}$ Triangle

30-60-90 Triangle



$$2^2 = x^2 + 1^2$$

$$4 = x^2 + 1$$

$$3 = x^2$$

$$x = \sqrt{3}$$

CAST Rule

S sin is pos. cos is neg. tan is neg.	A sin is pos. cos is pos. tan is pos.
sin is neg. cos is neg. tan is pos. T	sin is neg. cos is pos. tan is neg. C

Pythagorean Identity

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\sin^2 \theta = 1 - \cos^2 \theta$$

$$\sin^2 \theta = (1 - \cos \theta)(1 + \cos \theta)$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$= \frac{\Delta y}{\Delta x} = \text{slope}$$

$$\sin(x+y) = \sin x \cos y + \sin y \cos x$$

$$\sin(x-y) = \sin x \cos y - \sin y \cos x$$

$$\sin(2x) = 2 \sin x \cos x$$

$$\cos(x+y) = \cos x \cos y - \sin x \sin y$$

$$\cos(x-y) = \cos x \cos y + \sin x \sin y$$

$$\cos(2x) = \cos^2 x - \sin^2 x$$

Ex. 1: Solve

$$0 \leq x \leq 2\pi$$

$$4 = 2 \sin 2\left(x - \frac{\pi}{6}\right) + 3$$

$$1 = 2 \sin 2\left(x - \frac{\pi}{6}\right)$$

$$\frac{1}{2} = \sin 2\left(x - \frac{\pi}{6}\right)$$

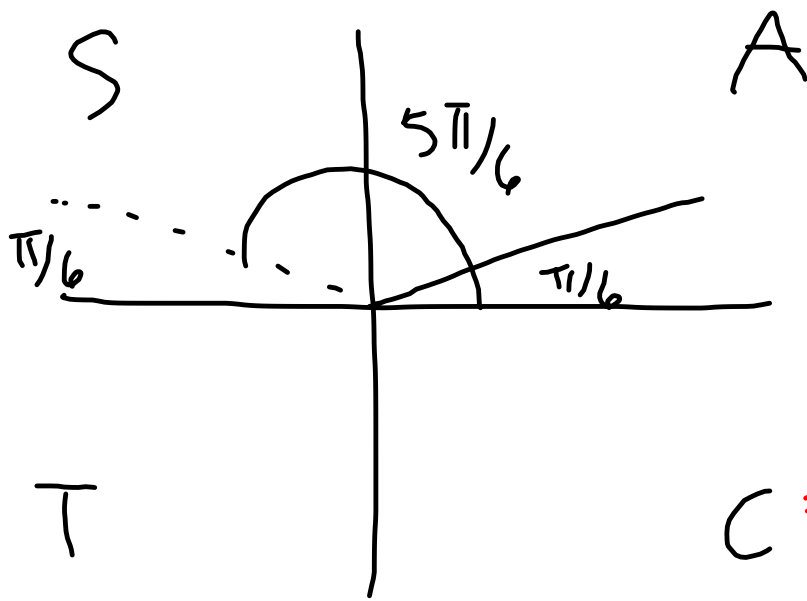
$$\sin^{-1}\left(\frac{1}{2}\right) = 2\left(x - \frac{\pi}{6}\right)$$

$$\frac{\pi}{6} = 2\left(x - \frac{\pi}{6}\right)$$

$$\frac{\pi}{12} = x - \frac{\pi}{6}$$

$$\boxed{\frac{\pi}{4} = x}$$

or $x = \pi + \frac{\pi}{4}$
 $\boxed{x = \frac{5\pi}{4}}$



Period

$$C = \frac{2\pi}{k} = \frac{2\pi}{2} = \boxed{\pi}$$

$$\text{or } \frac{5\pi}{6} = 2\left(x - \frac{\pi}{6}\right)$$

$$\frac{5\pi}{12} = x - \frac{\pi}{6}$$

$$\boxed{\frac{7\pi}{12} = x}$$

+ π

$$\boxed{x = \frac{19\pi}{12}}$$

Slope

Find the equation of a line going through

$$\begin{matrix} (-5, 2) & \text{and} & (3, -14) \\ x_1, y_1 & & x_2, y_2 \end{matrix}$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{-14 - 2}{3 - (-5)}$$

$$= \frac{-16}{8}$$

$$\boxed{m = -2}$$

$$y = mx + b$$

$$2 = (-2)(-5) + b$$

$$2 = 10 + b$$

$$\boxed{-8 = b}$$

$$\boxed{y = -2x - 8}$$

Instantaneous Rate of Change

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

a = initial x -value

h = increment

Find the inst. rate of change
of $f(x) = 2x^2 + x - 6$ at
 $x = 3$.

$$a = 3, h = 0.0001$$

$$m = \frac{f(3.0001) - f(3)}{0.0001}$$