$3\sqrt{6x+18} - 5$

$5\sqrt{7x+21} - 6$

In this, the "phase shift" is 3 units LEFT

m1

$\sqrt{x} \to 5\sqrt{x} \to 5\sqrt{7x}$ (0, 1, 3, 2)

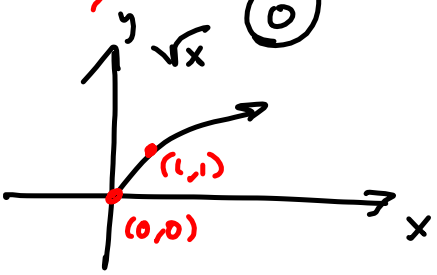
$\to 5\sqrt{7(x+3)} \to 5\sqrt{7(x+3)} - 6$

m2

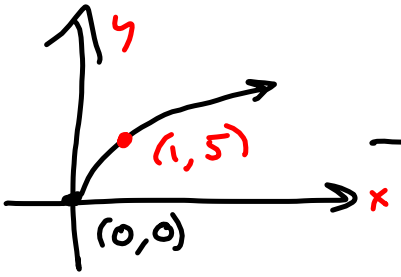
$\sqrt{x} \to 5\sqrt{x} \to 5\sqrt{x+21}$

$\to 5\sqrt{7x+21} \to 5\sqrt{7x+21} - 6$

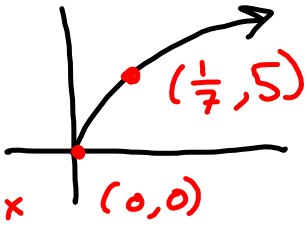
0 $\sqrt{x}$



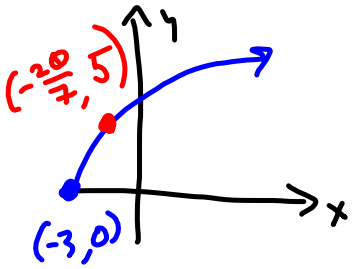
1 $5\sqrt{x}$



2 $5\sqrt{7x}$

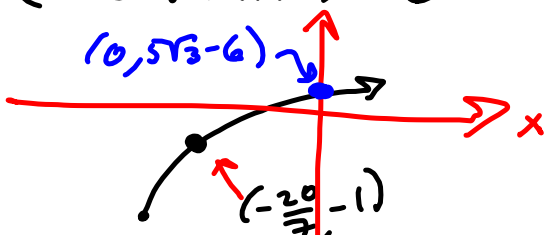


3 $5\sqrt{7(x+3)}$



$\frac{1}{7} - 3\left(\frac{7}{7}\right) = \frac{1}{7} - \frac{21}{7} = \frac{-20}{7}$

4 $5\sqrt{7(x+3)} - 6$



$5\sqrt{3} - 6$ ② $x = 0$ (y-intercept)

> 0, right?

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

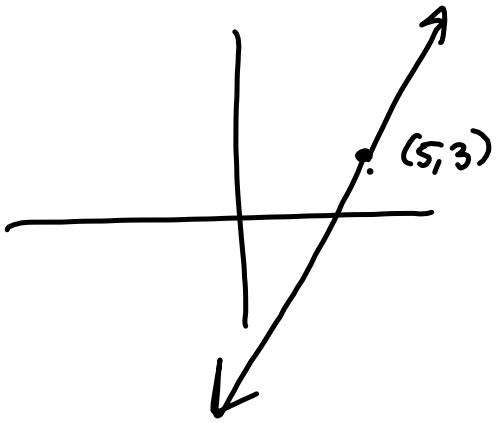
$y = 5(7x + 21) - 6$

① $y = x$ ② $y \to 5y$ $y = 5x$ ③ $x \to \frac{1}{7}x$ $y = 5(7x)$ ④ $x \to x - 3$ $y = 5(7(x+3))$

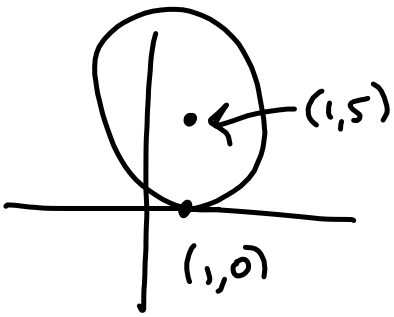
⑤ $y = 5(7(x+3)) - 6$

$y \to y - 6$

$y = 9(x - 5) + 3$



$(x-1)^2 + (y-5)^2 = 25$



Ex 1: Solve $2x^2-3x-7=0$ by completing the square

$2\left(x^2-\frac{3}{2}x-\frac{7}{2}\right)=0$

$x^2-\frac{3}{2}x-\frac{7}{2}=0$

$x^2-\frac{3}{2}x = \frac{7}{2}$

$x^2-\frac{3}{2}x+\left(\frac{3}{4}\right)^2 = \frac{7}{2}+\frac{9}{16} = \left(\frac{7}{2}\right)\left(\frac{8}{8}\right)+\frac{9}{16} = \frac{56+9}{16} = \frac{65}{16}$

$\frac{\frac{3}{2}}{2} = \left(\frac{3}{2}\right)\left(\frac{1}{2}\right) = \frac{3}{4} \rightarrow \left(\frac{3}{4}\right)^2 \rightarrow \frac{3^2}{4^2} = \frac{9}{16}$

ya wanna go straight to here

$\left(x-\frac{3}{4}\right)^2 = \frac{65}{16}$

In-between steps

$\sqrt{\left(x+\frac{3}{4}\right)^2} = \sqrt{\frac{65}{16}}$

$|x+\frac{3}{4}| = \frac{\sqrt{65}}{4}$

$x-\frac{3}{4} = \pm\sqrt{\frac{65}{16}} = \pm\frac{\sqrt{65}}{\sqrt{16}} = \pm\frac{\sqrt{65}}{4}$

$x = \frac{3}{4} \pm \frac{\sqrt{65}}{4}$

Completing the square cheat.

$\frac{b}{2a}$

$ax^2+bx+c = a\left(x+\frac{b}{2a}\right)^2 + \text{☺} + c$

$-\frac{9}{8}$ for this one.

$2x^2-3x-7=0$

$a=1,\ b=-3$

$(a-b)^2 = a^2-2ab+b^2$ own it!

$\frac{b}{2a} = \frac{-3}{2\cdot 2} = -\frac{3}{4}$

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

$= 2\left(x^2-\frac{3}{2}x+\frac{9}{16}\right)$

$= 2x^2-3x+\frac{9}{8}$

$a\left(x+\frac{b}{2a}\right)^2$

what we added to complete the square!

So.... subtract it back off!

$2\left(x-\frac{3}{4}\right)^2-\frac{9}{8}-7=0 \Rightarrow 2\left(x-\frac{3}{4}\right)^2-\frac{65}{8}=0$, etc.

$2\left(x-\frac{3}{4}\right)^2-\frac{65}{8}=0$

SUBTRACT that same amount to preserve the same expression

THIS is what we're doing in C2!

C2 question: Write $2x^2-3x-7$ in the form $a(x-h)^2+k$

you can use the cheat to get there. I think it's easier to do it w/o.

$= 2\left(x^2-\frac{3}{2}x\ \ \right)-7$

$= 2\left(x^2-\frac{3}{2}x+\left(\frac{3}{4}\right)^2\right)-7-2\left(\frac{9}{16}\right)$

$= 2\left(x-\frac{3}{4}\right)^2-\frac{65}{8}$

Vertex: $\left(\frac{3}{4},-\frac{65}{8}\right)$

opens up!

$\left(\frac{3}{4},-\frac{65}{8}\right)$