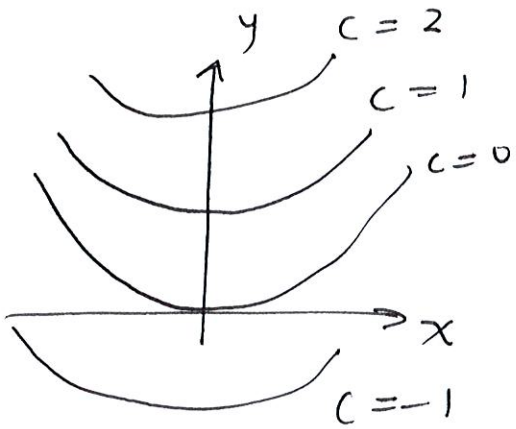
Math 3331 - ODEs

Now we start to find sol^{n}'s of ODE's.

Consider

$y = x^2 + c$ a parabola

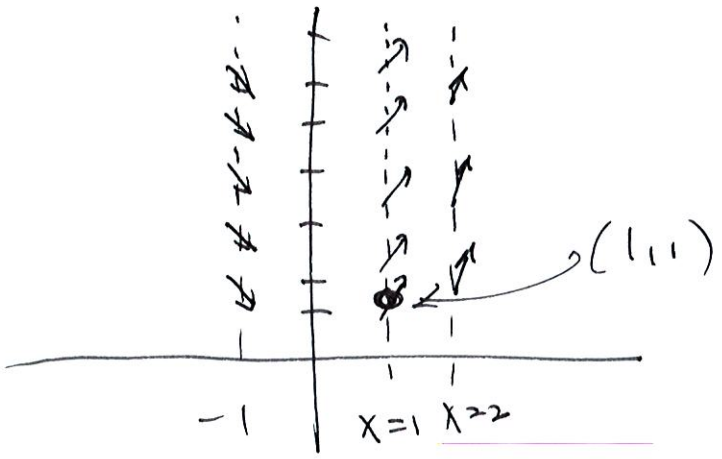
whose graph is pictured →



Now consider

$y' = 2x$ an ODE that arises from our sol^{n}

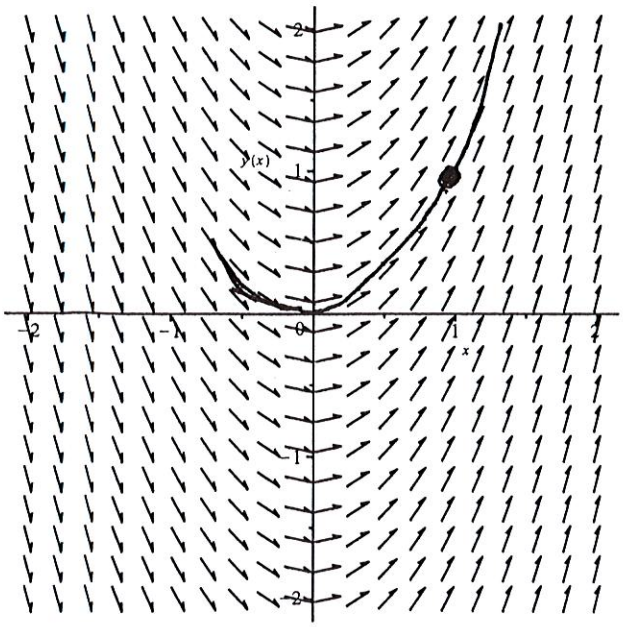
So given $y' = 2x$ could we get a graphically picture of the sol^{n}. If we think of y' as slope ~~as~~ as we change x then y' (the slope) changes

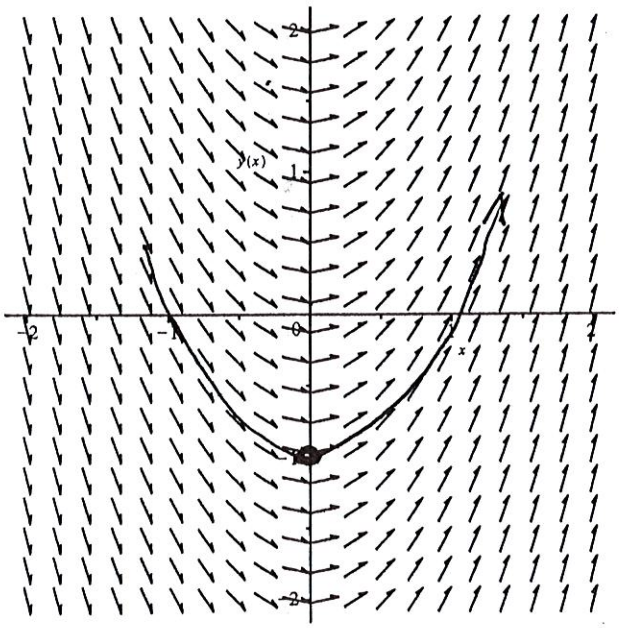


When $x=1$ $y'=2$, $x=2$, $y'=4$, $x=-1$, $y'=-2$

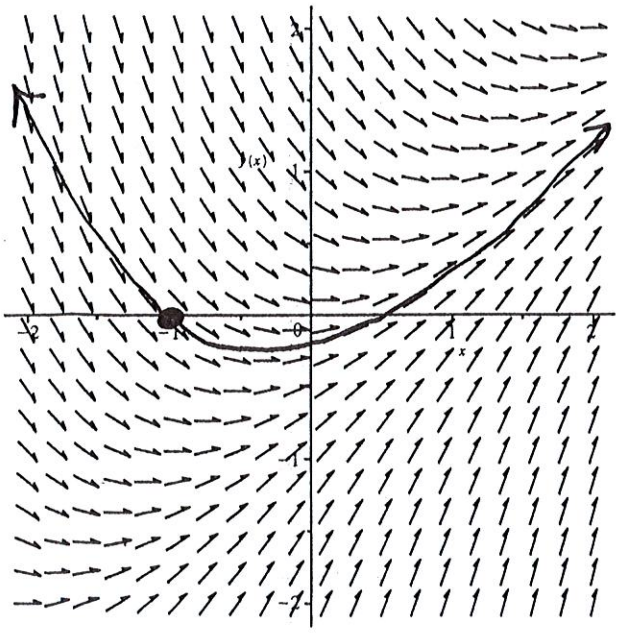
and $x=0$ $y'=0$ then starting at a particular pt $x=1, y=1$

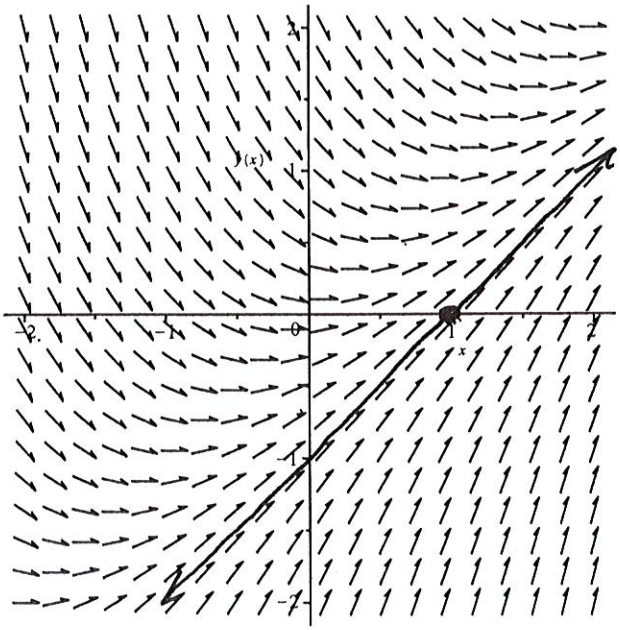
we just follow the arrows $y(1)=1$, $y(0)=-1$





Ex2 $y' = x - y$ $y(-1)=0$ $y(1,0)$

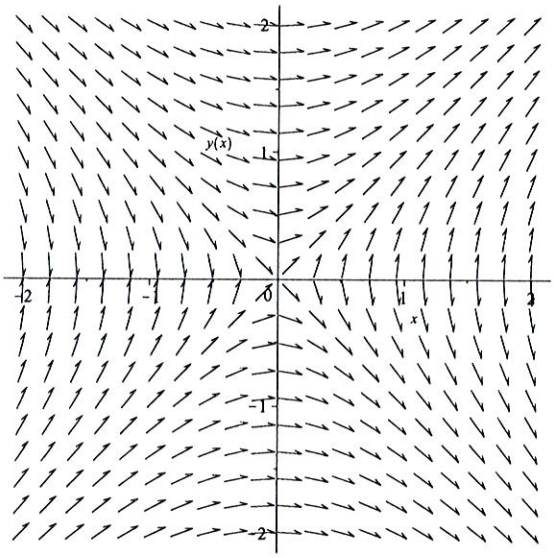


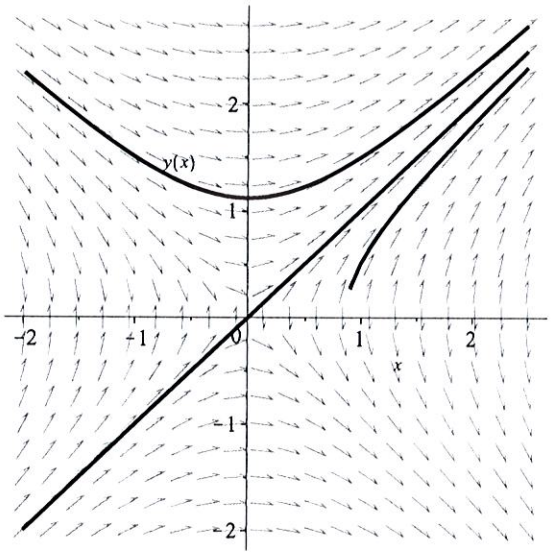


Notice in the top picture, the graphs are similar whereas in the second, really very different

Example. 3.

$$\frac{dy}{dx} = \frac{x}{y}, \quad (i)\ y(1) = 1, \quad (ii)\ y(1) = 0.5, \quad (iii)\ y(1) = 1.5.$$





Example. 4.

$$\frac{dy}{dx} = x^2 - y^2, \quad (i)\ y(-1) = 2, \quad (ii)\ y(0) = 0, \quad (iii)\ y(-2) = 0.$$