Slope Fields

A Picture of the Integral

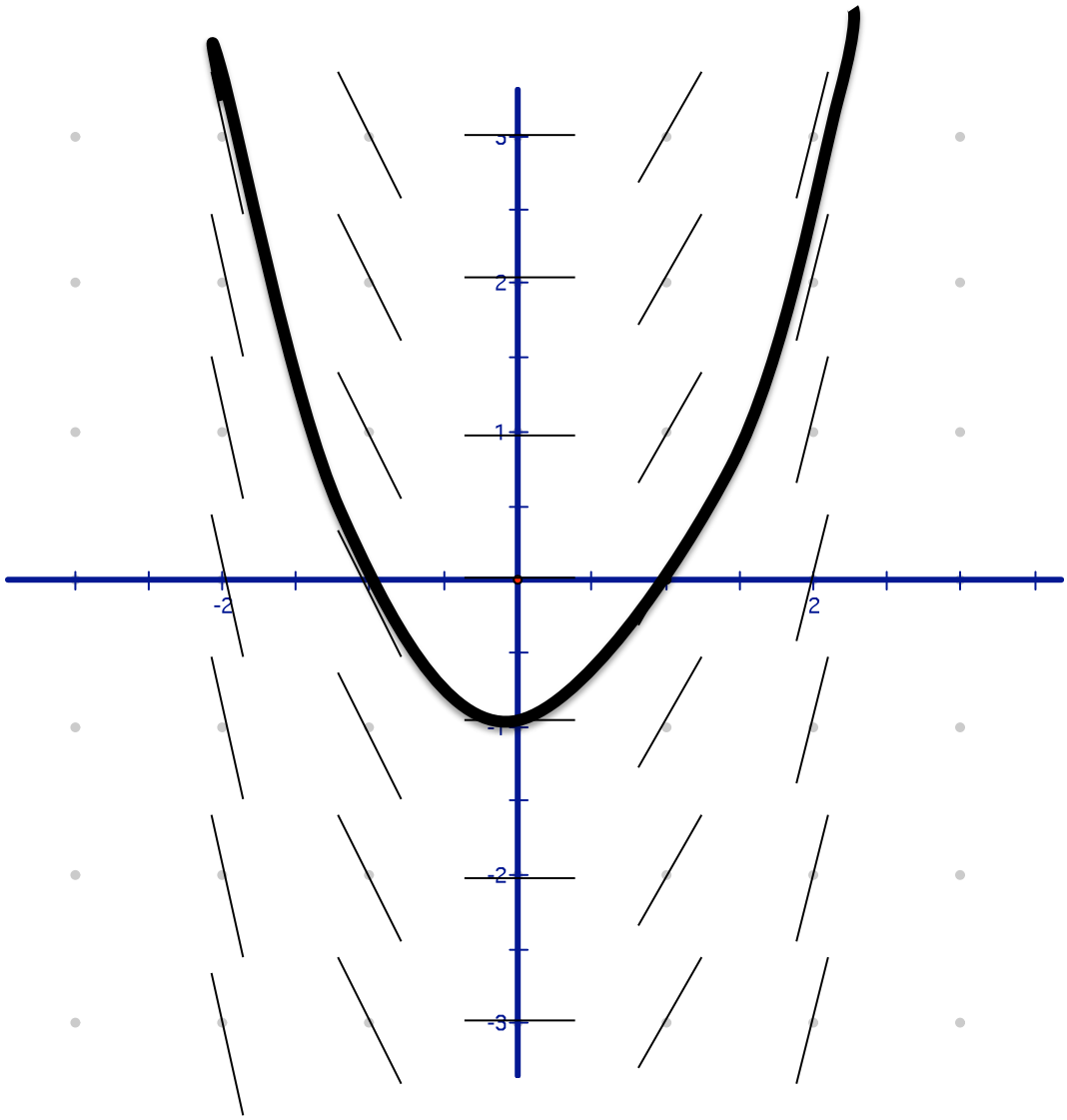
Let's consider a function whose derivative is as follows:

$$\frac{dy}{dx} = 2x$$

We are going to develop a picture of the function, using the slope field. We are going to pick values for x and calculate the slope for each of those values.

x	**slope**
–2	–4
–1	–2
0	0
1	2
2	4

Now we will plot the data and develop the picture.

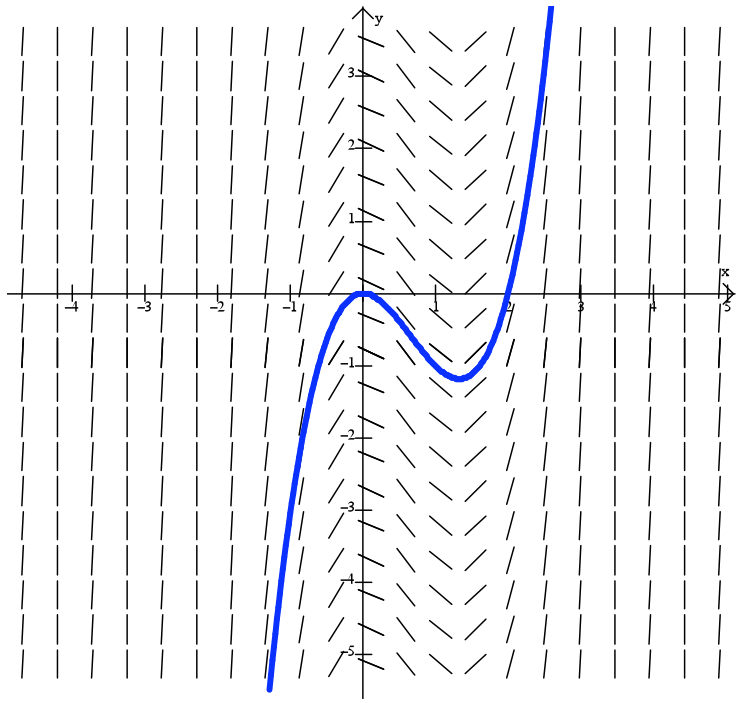


Notice the general shape; it makes a family of parabolas. The particular solution through $(1, 0)$ is $y = x^2 - 1$, which is graphed in the picture above.

Graph the following slope fields.

$$\frac{dy}{dx} = 3x^2 - 4x$$

–3	39
–2	20
–1	7
0	0
1	–1
2	4
3	15

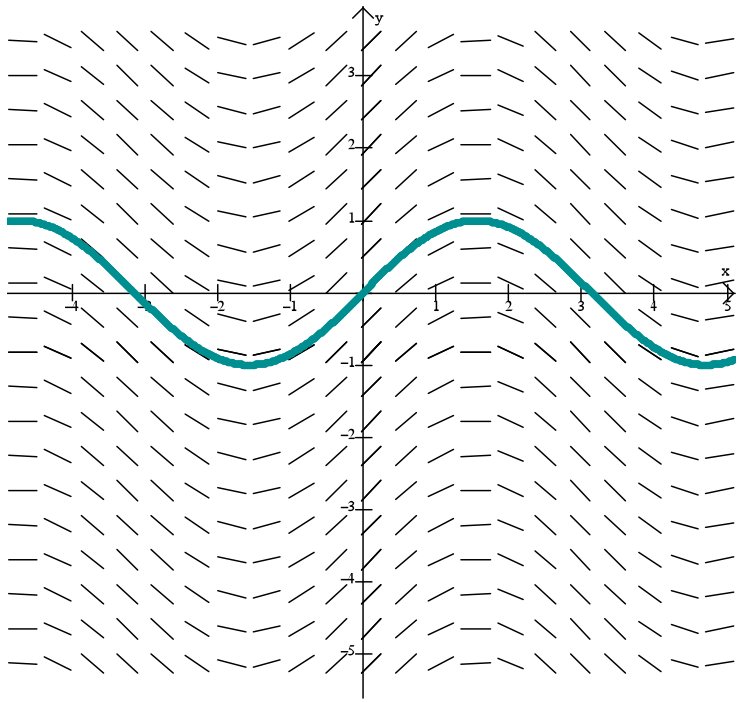


A general solution is graphed.

Use radians.

$$\frac{dy}{dx} = \cos x$$

$-3\pi/2$	0
$-\pi$	–1
$-\pi/2$	0
0	1
$\pi/2$	0
π	–1
$3\pi/2$	0



Remember the following:

- When the derivative is positive, the function is increasing.
- When the derivative is negative, the function is decreasing.
- Where the derivative changes from positive to negative, a maximum occurs.
- Where the derivative changes from negative to positive, a minimum occurs.

Sidenote: Winplot is a free download for PC users and a pretty good program for graphing slope fields. It is what I used on the previous page. For Mac users, check out the Grapher tool. Both programs are somewhat challenging to figure out, but if you are interested, I encourage you to give them a try.