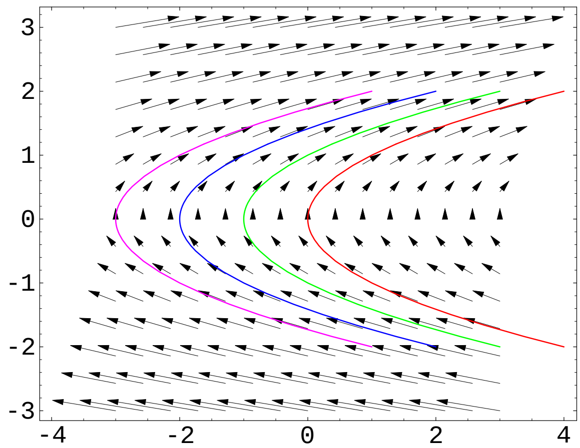

In this Example, we are asked to plot the vector field $\vec{F}(x,y) = y\vec{i} + \frac{1}{2}\vec{j}$. We will see that this vector field consists of the tangents to a certain family of parabolas.

We seek a curve $\vec{r}(t) = x(t)\vec{i} + y(t)\vec{j}$ such that

$$\vec{r}\,'(t) = x'(t)\vec{i} + y'(t)\vec{j} = y(t)\vec{i} + \frac{1}{2}\vec{j}$$

Setting $y'(t) = \frac{1}{2}$ we see that $y(t) = \frac{t}{2} + C$. Then we set $x'(t) = y(t) = \frac{t}{2} + C$ so that $x(t) = \frac{t^2}{4} + Ct + D$. Actually, we don't need so many parameters to get parabolas which collectively fill the whole xy-plane. We set $C = 0$ and let D vary over the real numbers. In the picture above we show the parabolas for $D = 0, -1, -2, -3$ and we can see that the vector field is tangent to the parabolas. (The vectors have been *scaled* so that the maximum length is one.) Such curves as these are called *integral curves* for the given vector field. We will not study integral curves in this course, but integral curves are very important in the study of *differential equations*.