

Integration gives,

$$\frac{dx}{dt} = C_1, \quad \frac{dy}{dt} = -gt + C_2.$$

When $t = 0$, $\frac{dx}{dt}$ and $\frac{dy}{dt}$ are the components of v_0 . Hence

$$C_1 = v_0 \cos \alpha, \quad C_2 = v_0 \sin \alpha,$$

and

$$\frac{dx}{dt} = v_0 \cos \alpha,$$

$$\frac{dy}{dt} = v_0 \sin \alpha - gt.$$

Integrating again, we get

$$x = v_0 t \cos \alpha,$$

$$y = v_0 t \sin \alpha - \frac{1}{2} g t^2,$$

the constants being zero because x and y are zero when $t = 0$.

5. Curves with a Given Slope. — If the slope of a curve is a given function of x ,

$$\frac{dy}{dx} = f(x),$$

then

$$dy = f(x) dx$$

and

$$y = \int f(x) dx + C$$

is the equation of the curve.

Since the constant can have any value, there are an infinite number of curves having the given slope. If the curve is required to pass through a given point P , the

value of C can be found by substituting the coördinates of P in the equation after integration.

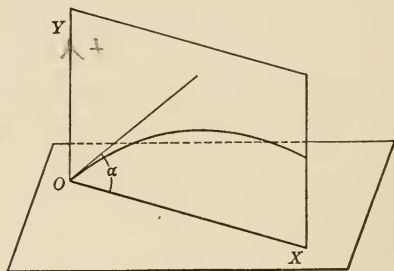


FIG. 4.

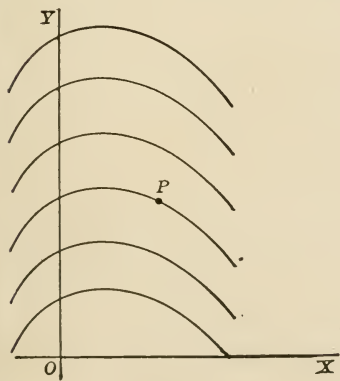


FIG. 5.