Solve 1^{st}_order D.E. $\frac{dy}{dx} = f(x.y)$ analytically

Type	general form	Technique
Seperable D.E.	$p(y)\frac{dy}{dx} = g(x)$	$p(y)dy = g(x)dx$ $\Rightarrow \int p(y)dy = \int g(x)dx + C$
1st_order linear	$\frac{dy}{dx} + p(x)y = g(x)$	$I(x) = e^{\int p(x)dx}$ $\frac{d}{dx}(Iy) = Ig(x) \Rightarrow y = \frac{1}{I}[\int I g(x)dx + c]$
1^{st}_order homogeneous	$\frac{dy}{dx} = f(x.y)$ where $f(x.y) = f(tx, ty)$	change variables — $u = \frac{y}{x}$ to reduce the D.E to a seperable D.E.
Bernoulli Equation	$\frac{dy}{dx} + p(x)y = g(x)y^n$	change variables — $u = y^{1-n}$ after dividing y^n to reduce the D.E to a 1st_order D.E
Exact D.E.	$M(x,y)dx + N(x.y) = 0$ with $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$	The solution is $\phi(x.y) = C$ where $\phi(x.y)$ is determined by $\frac{\partial \phi}{\partial x} = M$ and $\frac{\partial \phi}{\partial y} = N$