

1. Solve the following ODEs:

$$(a) \frac{dx}{dt} = \frac{x^2 + t\sqrt{t^2 + x^2}}{tx}$$

$$(b) \frac{dy}{dx} = \sqrt{x+y} - 1$$

$$(c) \frac{dx}{dt} + tx^3 + \frac{x}{t} = 0$$

$$(d) \frac{dy}{dx} = \sin(x-y)$$

$$(e) \frac{dr}{d\theta} = \frac{r^2 + 2r\theta}{\theta^2}$$

$$(f) \frac{dy}{dx} = \frac{y(\ln y - \ln x + 1)}{x}$$

2. Use the substitution $y = vx^2$ to solve

$$\frac{dy}{dx} = \frac{2y}{x} + \cos(y/x^2)$$