SHEET 3 FURTHER LINEAR FIRST ORDER DIFFERENTIAL EQUATIONS

1. Find the general solution of each of the following linear first order differential equations.

For the p.I. you may have to try something of the form $y = \alpha x e^{mx}$.

(a) $4\frac{dy}{dx} + 16y = 14 + x,$

(b) $4\frac{dx}{dt} + 6x = 15e^{t},$

(c) $-2\frac{dy}{dx} - 4y = 3x + 11,$

(d) $7\frac{dx}{dt} + 7x = 14t,$

(e) $\frac{dx}{dt} + x = 2e^{-t},$

(f) $\frac{dy}{dx} - 3y = 4e^{3x},$

(g) $2\frac{dx}{dt} + 8x = 2e^{-4t},$

(h) $3\frac{dy}{dx} - 3y = 4e^{x}.$

2. Solve each of the following linear first order differential equations.

(a) $\frac{dx}{dt} + 4x = e^{-4t},$ *given* $x = 2$ *at* $t = 0,$

(b) $4\frac{dy}{dx} + 8y = 4e^{-2x},$ *given* $y = 4$ *at* $x = 0,$

(c) $5\frac{dy}{dx} + 15y = 3e^{-3x},$ *given* $y = 6$ *at* $x = 0,$

(d) $-4\frac{dy}{dx} - 5y = 12e^{-\frac{5x}{4}},$ *given* $y = 2$ *at* $x = 0,$

(e) $-3\frac{dy}{dx} + 13y = 21e^{\frac{13x}{4}},$ *given* $y = -1$ *at* $x = 0,$