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8. (a) Show that the substitution $v = y^{-2}$ transforms the differential equation

$$\frac{dy}{dx} + 6xy = 3xe^{x^2}y^3 \qquad x > 0 \qquad \text{(I)}$$

into the differential equation

$$\frac{dv}{dx} - 12vx = -6xe^{x^2} \qquad x > 0 \qquad \text{(II)}$$

(5)

(b) Hence find the general solution of the differential equation (I), giving your answer in the form $y^2 = f(x)$.

(6)

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Q8

(Total 11 marks)

TOTAL FOR PAPER: 75 MARKS

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