

Math III
ASSIGNMENT - 1
SUBMIT by 16 August 2016

1. Study the Brachistochrone problem and write the setting up of a differential equation and solve it.
2. Solve the following linear differential equation:

$$y' + y = \frac{1}{1 + e^{2x}}$$

3. The equation

$$\frac{dy}{dx} + P(x)y = Q(x)y^n$$

is known as Bernoulli's equation. Show that it can be reduced to a linear equation (Note: it is linear for $n=0,1$), with a change of variable $z = y^{1-n}$ for $n \geq 2$. And apply this method to solve the following equation:

$$xy' + y = x^4y^3$$

4. Show that the substitution $z = ax + by + c$ changes $y' = f(ax + by + c)$ into an equation with separable variables and apply this method to solve the 1st order differential equation

$$y' = \sin^2(x - y + 1)$$

5. Solve $(3x^2 - y^2)dy - 2xydx = 0$ by finding an integrating factor.

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