

UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA
DEPARTMENT OF MATHEMATICAL SCIENCES
COURSE: SPECIAL MATHEMATICAL FUNCTIONS. CLASS: MA III
TRIAL TEST I – AUGUST, 2022 TIME: 1 HOUR
ANSWER ALL QUESTIONS

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Q1. Show that the solution to the differential equation $y' - 2xy = 1$, with initial condition $x = 0, y = 1$, is $ye^{-x^2} = 1 + \frac{\sqrt{\pi}}{2} \operatorname{erf}(x)$, where $\operatorname{erf}(x)$ is the error function.

P. T. O

Q2. Use successively the substitutions $x = -\ln u$ and $t = x(k+1)$ to show that the integral

$$\int_0^1 u^k (\ln u)^a du = \frac{(-1)^a a!}{(k+1)^{a+1}}$$

Q3. Evaluate the integral $\int_0^{\pi/2} \frac{\sqrt[3]{\sin^8 x}}{\sqrt{\cos x}} dx$