NAME ____

DATE ______________________________

This examination paper consists of 11 printed pages.

The paper consists of 10 questions.

The maximum mark for this examination is 60.

INSTRUCTIONS TO CANDIDATES

1. Write your name and the date clearly in the space provided.
2. Answer **ALL** questions.
3. Number your questions carefully and do **NOT** write your solutions to different questions beside one another.
4. Unless otherwise stated in the question, any numerical answer that is not exact, **MUST** be written correct to three (3) significant figures.

EXAMINATION MATERIALS ALLOWED

1. Mathematical formulae
2. Electronic calculator (non – programmable, non – graphical)

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1. Differentiate with respect to x

   (a) $\ln(x^2 + 4x + 5)$ [2]

   (b) $\frac{x^2}{e^{3x+2}}$ [4]

   (c) $x \tan^{-1}(x)$ [4]

2. Given that $\sin y = xy + y^2$, find $\frac{dy}{dx}$ in terms of x and y. [5]

3. A curve is defined parametrically by the equations

$$x = t - \ln t\,, \quad y = t + \ln t$$

   Find the gradient of the curve at the point where $t = 2$. [5]

4. Find the exact value of

$$\int_1^2 x \ln x \;dx$$

[5]

5. Using partial fractions, evaluate

$$\int \frac{x}{(x+1)(2x+1)}\;dx$$

[7]

6. Use the substitution $u = \cos x$, or otherwise, to find the exact value of

$$\int_0^{\frac{\pi}{3}} \sin^3 x \cos^2 x \;dx$$

[6]

7. Use the trapezium rule with 4 strips to evaluate

$$\int_1^2 \sqrt{1 + e^{-x}}\,dx$$

[5]

8. Find the complex number z such that

$$5iz + 3z^* + 16 = 8i$$

   Give your answer in the form $a + bi$, where a and b are real.

   NB: z^* is the conjugate of z.

[6]

9. (a) A circle C in the Argand diagram has equation

$$|z + 5 - i| = \sqrt{2}$$

   Write down its radius and the complex number representing its centre. [2]

(b) A half – line L in the Argand diagram has equation

$$\arg(z + 2i) = \frac{3\pi}{4}$$

Show that $z_1 = -4 + 2i$ lies on L. [3]

10. Use de Moivre's Theorem to show that

$$\cos 5\theta = \cos^5 \theta - 10 \cos^3 \theta \sin^2 \theta + 5 \cos \theta \sin^4 \theta$$

and find a similar expression for $\sin 5\theta$.

[6]

TOTAL 60 Marks

END OF EXAMINATION