

**LOCATION: SWANSEA SA1**

**LLEOLIAD: ABERTAWE**

**LEVEL 4**

**LEFEL 4**

**EXAMINATION PERIOD  
2021/2022**

**CYFNOD ARHOLIADAU  
2021/2022**

**MODULE CODE: ACDA4008**

**MATHEMATICS EXAM**

**TIME: 1.5 HOURS**

*Equipment or materials required –*

*Calculators allowed*

*Formula booklets provide*

***(Polynomial Division)***

***Q: no: 01 – – – (35 Marks)***

***(a) Differentiate each of the following expressions with respect to  $x$ , simplifying the***

***(i)  $y = \frac{x^2}{2x + 1}$***

***(ii)  $y = \sqrt{x^2 + 1}$***

(iii)  $y = 3x^{3/2} + \frac{3}{x^2} - 6x$

(iv)  $y = \sec^3 4x$

(v)  $y = (x + \sin 2x)$

(vi)  $y = \frac{1 - 10x}{(2x - 1)^2}$

(b) Given  $y = \frac{1}{x} + \cos 2x$ , find  $\frac{d^5 y}{dx^5}$ ,

*Simplify your answer.*

(c) If  $f(x) = \ln(\operatorname{cosec} x - \cot x)$  then show that clearly that  $f'(x) = \operatorname{cosec} x$ .

**Q: no: 02 – – – (35 Marks)**

(a) Evaluate each of the following integrals, giving the answers in exact form.

(i)  $\int \frac{2x}{(4 + 3x^2)} dx$

(ii)  $\int_0^4 e^{\frac{1}{2}x} dx$

(iii)  $\int_0^4 \frac{5x + 13}{(2x + 1)(x + 4)} dx$

(b) By using a suitable method, find the integral of following function

$$f(x) = \frac{4}{x(1 + 4\ln x)^2} dx$$

**(c) Use integration by parts to find the value of following integrals,**

**(i)**  $\int_{\ln 2}^{\ln 5} \frac{3e^{2x}}{\sqrt{e^x - 1}} dx$

**(ii)**  $\int_1^e \ln x \, dx$

**Q: no: 03 – – – (30 Marks)**

**(a) Express the following in the form  $a + ib$  where  $a$  and  $b$  are real numbers.**

**(i)**  $\left(\frac{1+i}{1-i}\right)^3$

**(ii)**  $\frac{3}{(1+i)(2+i)}$

**(iii)**  $\frac{1+i}{1-i} - (1+2i)(2+2i) + \frac{3-i}{1+i}$

**(iv)**  $2i(i-1) + (\sqrt{3}-i) + (1+i)(\overline{1+i})$

**(b) Express the following complex number in polar form.**

**$Z = (4 + 7i)(3 - 2i)$**

**(c) Find the quotient of  $1 + 3i$  and  $1 + i$ .**