

$$b) \quad z = (4 + 7i)(3 - 2i)$$

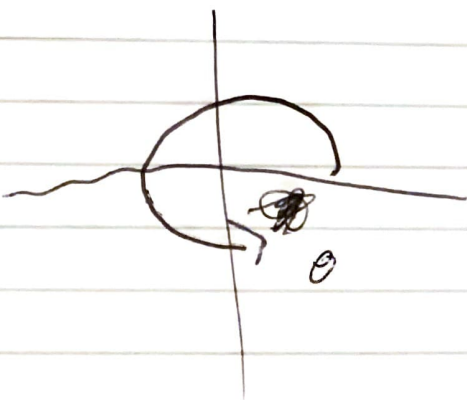
$$= \underset{\substack{\uparrow \\ a}}{12} - \underset{\substack{\uparrow \\ b}}{8i} + 2i + \underset{\substack{\uparrow \\ b}}{14i}$$

$$= \underset{\substack{\uparrow \\ a}}{26} - \underset{\substack{\uparrow \\ b}}{6i}$$

$$z = \sqrt{(26)^2 + (-6)^2}$$

$$= 2\sqrt{178}$$

$$= 26.6833$$



$$\theta = \tan^{-1}\left(\frac{b}{a}\right)$$

$$\theta = \tan^{-1}\left(\frac{-6}{26}\right)$$

$$= 12.99$$

$$360 - 12.99^\circ$$

$$= 347^\circ$$

$$\underline{\underline{2\sqrt{178} \angle 347^\circ}}$$

Q2

(ii)

$$\int_0^4 e^{\frac{1}{2}x}$$

$$e^{\frac{1}{2}x}$$

$$u = \frac{1}{2}x$$

$$\left[\frac{x^{-1}}{e^{\frac{1}{2}x}} \right]_0^4 + \left[\frac{x^{-1}}{e^{\frac{1}{2}x}} \right]$$

$$du = \frac{1}{2} dx \quad \frac{\frac{1}{2} \cdot 1}{e^{\frac{1}{2}x}}$$

Q2.a)

i.

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

constant

∴

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

$$\frac{4+3x^2}{}$$

$$= 6x$$

$$= 2x$$

$$2 \int \frac{x}{6x}$$

$$\int \frac{1}{u} du$$

$$= 2 \cdot \frac{1}{6}$$

$$= 2 \times \frac{1}{6} \ln(4+3x^2)$$

∴ ~~du~~

$$\frac{du}{dx} = \frac{1}{3} (4+3x^2) + C$$

Ex 3

Q3. c) $\frac{1+i}{1+i} \times \frac{1+i}{1+i}$

$$\frac{1+3i}{1+i} \frac{1-i}{1-i}$$

$$= \frac{1+i(1+i)}{1-i(1+i)}$$

$$= \frac{(1+3i)(1-i)}{(1+i)(1-i)}$$

$$= \frac{\cancel{1} + i + \cancel{i} + i^2}{1 + i - i - i^2}$$

$$= \frac{1 - i + 3i + 3\cancel{i^2}}{1 - i^2 - i^2 + 1}$$

$$= \frac{2i}{2}$$

$$= \frac{4+2i}{2} = 2$$

$$= \frac{2+i}{2}$$

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

$$2i^2 - 2i + \sqrt{3} - i + 1 + i + i + i^2$$

$$2i^2 - 2 - 2i + \sqrt{3} - i + 2i$$

$$= \underline{\underline{-2\sqrt{3} - i}}$$

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$$2i^2 - 2 - 2i + \sqrt{3} - i + 2i$$

$$= \underline{\underline{-2\sqrt{3} - i}}$$

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

$$\frac{1+i}{1-i} \times \frac{1+i}{1+i}$$

$$\Rightarrow \frac{1+i(1+i)}{1-i(1+i)}$$

$$= \frac{1+i+i+i^2}{1+i-i-i^2}$$

$$\Rightarrow \frac{1+2i-1}{2i}$$

$$2i$$

$$(1+2i)(2+i)$$

$$2+i+4i+2i^2$$

$$= 2+5i-2$$

$$=$$

$$\frac{3-i}{1+i} \times \frac{(1-i)}{(1-i)}$$

$$= \frac{(3-i)(1-i)}{(1+i)(1-i)}$$

$$= \frac{3-3i-i+i^2-1}{1-i^2}$$

$$= \frac{2-2i}{2}$$

$$2+5i+2-2i$$

$$= 4+3i$$

Q3.

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

$$\begin{aligned} (a+3)^3 &= (1+i)^3 + (1-i)^3 + 3(1+i)(1-i)((1+i)+(1-i)) \\ &= i^3 + -i^3 + \cancel{3} + \cancel{3i} + \cancel{3} - \cancel{3i} ((1+i)+(1-i)) \\ &= \cancel{i^3} + \cancel{-i^3} + 6((1+i)+(1-i)) \\ &= (\cancel{6} + \cancel{6i}) + (\cancel{6} - \cancel{6i}) \\ &= \underline{0} \quad \therefore a+ib = \underline{0} \end{aligned}$$

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

$$\frac{3}{2+i+2i+i^2}$$

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

$$= \frac{3}{1+3i} \times \frac{(1-3i)}{(1-3i)}$$

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

$$= \frac{3-9i}{1-3i+3i-9i^2} (1)$$

$$= \frac{3-9i}{10}$$

Q1 b) $\frac{1}{x} + \cos 2x$

$$\frac{dy}{dx} = \ln x - 2 \sin x$$

$$U = \ln \quad U' = \frac{1}{x}$$

$$q^2 = \frac{1}{x} + \cos 2x$$

$$V = \csc x \cot x \quad V' = -\cot x \csc x - \csc^2$$

$$d^3 = \frac{1}{x} - 2 \sin 2x$$

$$u^4 = \ln x + 2 \cos 2x$$

c) $f(x) = \ln(\csc x - \cot x)$

$$a^5 = \frac{1}{x} - 2 \sin 2x$$

$$\frac{dy}{dx} = \frac{1}{x} (\csc x - \cot x) + \cot x (\csc x) \csc^2 - \ln x$$

$$\frac{d^5 y}{dx^5} = x (-2 \sin 2x)$$

$$= \boxed{\begin{matrix} \csc x - \cot x - \ln \cot x \\ - \csc^2 \end{matrix}} \quad \text{Q1 C}$$

$$= \frac{1}{x} \csc x - \frac{1}{x} \cot x + - \ln \cot x - \ln \csc^2$$

$$= \frac{\csc x}{x} - \frac{\cot x}{x} - \ln \cot x - \ln \csc^2$$

$$= \csc x - \cot x$$

(i)
iv)

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

$$du = \sec^3 dx$$

$$y = 3(4x)^2 \sec x \tan x$$

$$du = 4x \quad du' = 4$$

$$\frac{dy}{dx} = \sec^3$$

$$v = u^3$$

$$\frac{dv}{dx} = 3u^2$$

$$u = \sec \quad u' = (\sec x \tan x)$$

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

$$\frac{dy}{dx} = \frac{9}{2} x^{1/2} - 6x - 6$$

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

$$u' = x \quad = 1$$

$$\frac{dy}{dx} = 1 + 2\cos 2x$$

$$u = \sin = 2\cos x$$

$$= 1(\sin 2x) + 2\cos 2x(x)$$

$$u = 2x = 2$$

$$= \sin 2x + 2x \cos 2x$$

Q1.a

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

$$u = x^2 \quad u' = 2x$$

$$v = 2x+1 \quad v' = 2$$

$$\frac{dy}{dx} = \frac{2x+1(2x) - x^2(2)}{(2x+1)^2}$$

$$= \frac{4x^2 + 2x - 2x^2}{(2x+1)^2}$$

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

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

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

$$= \frac{1}{2} (x^2 + 1)^{-\frac{1}{2}}$$

$$= \frac{1}{2} (x^2 + 1) \cdot 2x$$

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