

Q1)

a) $\int 7x^4 + 2x + 8 \, dx$

$$= \frac{7x^5}{5} + \frac{2x^2}{2} + 8x + C$$

b) $\int \frac{1}{x^3}$

$$= \int x^{-3}$$

$$= \frac{x^{-2}}{-2} + C$$

c) $\int \sec^2 x \, dx$

$$= \tan x + C$$

d) $\int (x+4)^2 \, dx$

$$= \int (x+4)(x+4) \, dx$$

$$= \int x^2 + 8x + 16 \, dx$$

$$= \frac{x^3}{3} + \frac{8x^2}{2} + 16x + C$$

$$e) \int_0^4 x^3 + 5x + 2 \, dx$$

$$= \left[\frac{x^4}{4} + \frac{5x^2}{2} + 2x \right]_0^4$$

$$= \left(\frac{(4)^4}{4} + \frac{5(4)^2}{2} + 2(4) \right) - [0]$$

$$= (64 + 40 + 8) - [0]$$

$$= 112$$

$$f) \int_1^2 (x+2)(x+3) \, dx$$

$$\int_1^2 x^2 + 5x + 6 \, dx$$

$$= \left[\frac{x^3}{3} + \frac{5x^2}{2} + 6x \right]_1^2$$

$$= [2 \cdot 67 + 10 + 12] - [0.33 + 2.5 + 6]$$

$$= [24.67] - [8.83]$$

$$= 15.84$$

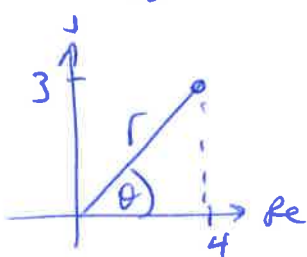
Q2) a) $z_1 = 2 + 3j$, $z_2 = 5 - j$

(i) $z_1 + z_2 = (2 + 3j) + (5 - j)$
 $= 7 + 2j$

(ii) $z_1 - z_2 = (2 + 3j) - (5 - j)$
 $= 2 + 3j - 5 + j$
 $= -3 + 4j$

(iii) $z_1 z_2 = (2 + 3j)(5 - j)$
 $= 10 - 2j + 15j - 3j^2$ $[j^2 = -1]$
 $= 10 + 13j + 3$
 $= 13 + 13j$

b) $(4 + 3j)^6$



$$r^2 = 4^2 + 3^2$$

$$r = 5$$

$$\tan \theta = \frac{3}{4}$$

$$\theta = 36.87^\circ$$

DMT $\Rightarrow r^n (\cos n\theta + j \sin n\theta)$

$$n = 6$$

$$(5)^6 (\cos 6 \times 36.87 + j \sin 6 \times 36.87)$$

$$15625 (\cos 221.22 + j \sin 221.22)$$

Multiply out for rectangular form:

$$-11752.89 - 10296.13j$$

Q3) a) $y = 7x^2 + 2x + 1$

$$\frac{dy}{dx} = 14x + 2$$

b) $y = (x+7)(x+2)$
 $y = x^2 + 9x + 14$

$$\frac{dy}{dx} = 2x + 9$$

c) $y = 2x^2 - 9x + 6$

$$\frac{dy}{dx} = 4x - 9$$

d) $y = \tan x$

$$\frac{dy}{dx} = 3 \sec^2 3x$$

e) $y = \frac{1}{x^9}$

$$y = x^{-9}$$

$$\frac{dy}{dx} = -9x^{-10}$$

f) $y = \underset{\uparrow u}{x^2} \underset{\downarrow v}{\cos x}$ $\frac{du}{dx} = 2x, \frac{dv}{dx} = -\sin x$

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

g) $y = \frac{e^{3x} \leftarrow u}{\sin x \leftarrow v} \mid \frac{du}{dx} = 3e^{3x}, \frac{dv}{dx} = \cos x$

$$\frac{dy}{dx} = \frac{(\sin x)(3e^{3x}) - (e^{3x})(\cos x)}{(\sin x)^2}$$

h) $y = (5x^3 - 1)^4$

$$\frac{dy}{dx} = 4(5x^3 - 1)^3 (15x^2)$$

Q4)

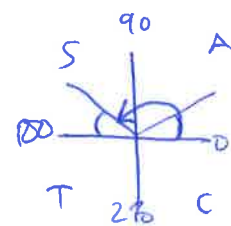
a) $\sin x = 0.26$

$$x = \sin^{-1}(0.26)$$

$$x = 15.07^\circ$$

$$x = 180 - 15.07$$

$$x = 164.93^\circ$$



b) $\cos x = 0.32$

$$x = \cos^{-1}(0.32)$$

$$x = 71.34^\circ$$

$$x = 360 - 71.34$$

$$x = 288.66^\circ$$

