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Q1: a

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

$\frac{u'v - v'u}{v^2}$

$u = 1-10x \quad u' = -10x$

$v = (2x-1)^2 \quad v' = 4x$

$= \frac{(-10x)(2x-1)^2 - (4x)(1-10x)}{((2x-1)^2)^2}$

$4x \times 1 = 4x$

$4x \times -10x = -40x^2$

$-10 - 4 = -14x$

$= -10 \times 2 = -20x^2 = -400x$

$-10 \times -1 = 10x^2 = 100x$

$2x^2 = 4x \times -10x = -40x^2$

$-1^2 = -1 \times -10x = 10x$

$= \frac{(-40x^2 + 10x) - (4x - 40x^2)}{(2x-1)^2)^2}$

~~$-40 - (-40) = 0$~~

$-40 - (-40) = 0$

$10 - 4 = 6x$

ANS: $y' = \frac{6x}{((2x-1)^2)^2}$

Q1: b Given $y = \frac{1}{x} + \cos 2x$, find $\frac{d^5y}{dx^5}$

$x \quad y$

$1 - \sin 2x$

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

$\cos 2x = -\sin 2x$

$5 - \sin 2x$?

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Q2: a

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

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

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Q2:a) Evaluate integrals

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

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

ii) $\int_0^4 \frac{1}{e2^x} dx$

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Q1: a

i) $y = \frac{x^2}{2x+1}$ | $\frac{u}{v}$

$\frac{u'v - v'u}{v^2}$

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

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

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

$= \frac{(4x^2 + 2x) - (2x^3)}{(2x+1)^2}$

$= \frac{(6x^3) - (2x^3)}{(2x+1)^2}$

ANS:

$y' = \frac{4x^3}{(2x+1)^2}$

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

$u = x^2+1 \quad u' = 2x$

$v = \sqrt{} \quad v' = \frac{1}{2}$

ANS: $y' = \cos^{-1} 2x$

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

$3x^{\frac{3}{2}} = 9x^{\frac{2}{2}}$

$\frac{3}{x^2} = 2x$

$-6x = -6x$

$9x^{\frac{2}{2}} + 2x - 6x$

ANS: $9x^{\frac{2}{2}} - 4x$

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

$u = \sec^3$ $u' = \sec^3 \tan^3$

$V = 4x$ $V' = 4x$

$uV' + u'v$

$(\sec^3)(4x) + (\sec^3 \tan^3)(4x)$

$(\sec^3 4x) + (\sec^3 \tan^3 4x)$

ANS $= \sec^6 \tan^3 8x$

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

$u = x$ $u' = 1$

$V = \sin 2x$ $V' = \cos 2x$

ANS $y' = 1 + \cos 2x$

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Q2: C

i) integration by parts

$$\int_{\ln 2}^{\ln 5} \frac{3e^{2x}}{\sqrt{e^x - 1}}\, dx$$

ii) $$\int_{1}^{e} \ln x\, dx$$

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Q3: a (cont.) $2i$ $a+b+c$

$a = -2-2i$
$b = \sqrt{3} - i$
$c = 0-2i$

$(-2-2i)+(\sqrt{3}-i)+(0-2i)$
$-2+\sqrt{3}+0 = -0.26$
$-2i-i-2i = -5i$

$\sqrt{3} = 3^{\frac{1}{2}}$

ANS: $-0.26 - 5i$

Q3: b - polar form

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

F	O	I	L
4×3	$4 \times -2i$	$7i \times 3$	$7i \times -2i$
12	$-8i$	$21i$	$-14i^2 = 14$

$12 + 14 = 26$
$-8 + 21i = 13i$

$z = 26 + 13i$ $\quad x = 26$ $\quad y = 13i$

$\tan^{-1}\frac{13i}{26} = 26.56$

$180 - 26.56 = 153.44$

ANS: $z = 153.44$

Q3: c - Quotient

a $\quad$ b
$1+3i$ & $1+i$
$x \quad y$

$a = 1+3i$

$\sqrt{x^2+y^2}$

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

ANS: $|z| = i\sqrt{2}$

$x \quad y$
$b = 1+i$

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

ANS: $|z| = 0$

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Q3: a

a b c

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

F	O	I	L
1x1	1xi	ix1	ixi
1	i	i	$i^2=-1$
1x1	~~ix~~1xi	-ix1	-ixi
1	i	-i	$-i^2=1$
1x2	1x2i	2ix2	2ix2i
2	2i	4i	$4i^2=-4$
3x1	3x-i	-ix1	-ix-i
3	-3i	-i	$i^2=-1$
1x1	1x-i	ix1	ixi
1	-i	i	$-i^2=1$

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

$1-1=0$
$i+i=2i$
$1+1=2$
$i-i=0$ & i

$a = \frac{0+2i}{2+0i}$ $\quad b = 2-4 = -2$, $2i+4i=6i$, $b=-2+6i$

$c = \frac{3-i}{1+i} \times \frac{1-i}{1-i}$ $\quad 3-\cancel{2}^{1} = 2$, $-3i-i=-4i$ $\quad 1+1=2$, $-i+i=0i$

$c = \frac{2-4i}{2+0i}$

$= \frac{0+2i}{2+0i} - (-2+6i) + \frac{2-4i}{2+0i}$

$\frac{0}{2} - (-2) + \frac{2}{2} = 3$

$\frac{2i}{0i} - 6i + \frac{4}{0}i = \frac{0i}{0i} = 0i$

ANS: $3+0i$

a b c ~~d~~

iv) $2i(i-1) + (\sqrt{3}-i) + (1+i)\overline{(1+i)}$ $\quad a+b+c$

$a = 2i \times (i-1)$ $\quad 2ixi = 2i^2 = -2$, $2ix-1 = -2i$ $\quad a = -2-2i$

$b = \sqrt{3} - i$ = ~~N/A~~

$c = (1+i)\overline{(1+i)}$ =

1x-1	1x-i	ix-1	ix-i
-1	-i	-i	$-i^2=1$

$-1+1=0$
$-i-i=-2i$
$c = 0-2i$

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Q3: a: Express in term $a+bi$

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

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

$1+1=2$
$-i+i=0$
$1-1=0$
$-i-i=-2i$

$\frac{2+0i}{0-2i}$

F	O	I	L
1×1	$1\times i$	$i\times1$	$i\times i$
1	i	i	$i^2=-1$
1×1	$1\times-i$	$i\times1$	$i\times-i$
1	$-i$	i	$-i^2=1$
1×1	~~$1\times i$~~ $1\times-i$	$-i\times1$	$-i\times-i$
1	$-i$	$-i$	$i^2=-1$

$\left(\frac{2+0i}{0-2i}\right)^3 = \left(\frac{2+0i}{0-2i}\right)\left(\frac{2+0i}{0-2i}\right)$

$4-1=3$
$0+0=0$
$0-4=-4$
$0+0=0$

$\left(\frac{3+0i}{-4+0i}\right)\left(\frac{2+0i}{0-2i}\right)$

F	O	I	L
2×2	$2\times0i$	$0i\times2$	$0i\times0i$
4	$0i$	$0i$	$0i^2=-1$
0×0	$0\times-2i$	$-2i\times0$	$-2i\times-2i$
0	$0i$	$0i$	$4i^2=-4$

3×2	$3\times0i$	$0i\times2$	$0i\times0i$
6	$0i$	$0i$	$0i^2=-1$
-4×0	$-4\times-2i$	$0i\times0$	$0i\times-2i$
0	$8i$	$0i$	$0i^2=-1$

$6-1=5$ ~~$+0i$~~
$0+0=0$
$0-1=-1$
$8+0=8i$

ANS: $\frac{5+0i}{-1+8i}$

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

$2-1=1$
$i+2i=3i$

F	O	I	L
1×2	$1\times i$	$i\times2$	$i\times i$
2	i	$2i$	$i^2=-1$
$3\times-3i$	$3i\times-3i$		
$-3i$	$-9i^2=9$		

$\frac{3}{3i} \times \frac{-3i}{-3i}$

ANS: $9-3i$