

Further Mathematics Test 2
May 2017

M4X01S03

Q1)

(i) $\int 6x^3 - 2x^2 + 5x + 1 \, dx$

$$= \frac{6x^4}{4} - \frac{2x^3}{3} + \frac{5x^2}{2} + x$$

$$= \frac{3x^4}{2} - \frac{2x^3}{3} + \frac{5x^2}{2} + x + c$$

|||||

⑤

(ii) $\int \sec^2 5x + 2 \sin 3x \, dx$

$$= \frac{1}{5} \tan 5x - \frac{2}{3} \cos 3x + c$$

|||

③

(iii) $\int \frac{2}{x} + 5x^{-2} \, dx$

$$= 2 \ln x + \frac{5x^{-1}}{-1}$$

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$$= 2 \ln x - \frac{5}{x} + c$$

|||

④

$$(iv) \int x^{0.5} + x^{0.33}$$

$$= \frac{x^{1.5}}{1.5} + \frac{x^{1.33}}{1.33} + C$$

$$\text{i.e.} \\ = \frac{x^{3/2}}{3/2} + \frac{x^{4/3}}{4/3} + C$$

| | |

(4)

$$(v) \int (x+5)(2x+1) dx$$

$$\int 2x^2 + x + 10x + 5 dx$$

$$\int 2x^2 + 11x + 5 dx$$

$$= \frac{2x^3}{3} + \frac{11x^2}{2} + 5x + C$$

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| | | |

(5)

$$(vi) \int_0^3 (x^2+1)(x+5) dx$$

$$\left[x^3 + 5x^2 + x + 5 \right]_0^3$$

$$= \left[\frac{x^4}{4} + \frac{5x^3}{3} + \frac{x^2}{2} + 5x \right]_0^3$$

$$= \left[\frac{(3)^4}{4} + \frac{5(3)^3}{3} + \frac{(3)^2}{2} + 5(3) \right] - [0]$$

$$= [20.25 + 45 + 4.5 + 15] - [0]$$

$$= 84.75$$

$$(vii) \int_2^3 3e^x + 1 dx$$

$$= \left[3e^x + x \right]_2^3$$

$$= [3e^3 + 3] - [3e^2 + 2]$$

$$= [63.26] - [24.17]$$

$$= 39.09$$

⑧

⑤

Q2)

(i) $\ln R - \ln T$

$$= \ln \frac{R}{T}$$

①

(ii) $2 \log x + \log y$

$$= \log x^2 + \log y$$

$$= \log x^2 y$$

②

Q3) (i) $6 = 2 \times 3^x$

$$\log 6 = \log 2 \times 3^x$$

$$\log 6 = \log 2 + \log 3^x$$

$$\log 6 = \log 2 + x \log 3$$

$$\log 6 - \log 2 = x \log 3$$

$$\log 3 = x \log 3$$

$$1 = x$$

③

$$(i) \quad 4^{x+1} = 7^x$$

$$\log 4^{x+1} = \log 7^x$$

$$(x+1) \log 4 = x \log 7$$

$$0.60x + 0.60 = 0.85x$$

$$0.60 = 0.85x - 0.60x$$

$$0.60 = 0.25x$$

$$2.4 = x$$

(5)

$$(ii) \quad \log(x+5) + \log(x+1) = \log(x+2) + \log(x+3)$$

$$\log(x+5)(x+1) = \log(x+2)(x+3)$$

$$x^2 + 6x + 5 = x^2 + 5x + 6$$

$$x = 1$$

(4)

$$(iv) \quad \ln(x+3) - \ln(x+1) = \ln(x+2) - \ln(x+6)$$

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

$$(x+3)(x+6) = (x+2)(x+1)$$

$$x^2 + 9x + 18 = x^2 + 3x + 2$$

$$9x - 3x = 2 - 18$$

$$(iv) \quad 2\ln(x+3) = \ln(x+2) + \ln(x+6)$$

$$\ln(x+3)^2 = \ln(x+2)(x+6)$$

$$x^2 + 6x + 9 = x^2 + 8x + 12$$

$$9 - 12 = 8x - 6x$$

$$-3 = 2x$$

$$\left(-\frac{3}{2} = x\right)$$

(5)