

Maths Test 13/01/22

Like Malcolm

Q1

a
i diff. with respect to x , implicit

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

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

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

$$= \frac{x}{\sqrt{x^2+1}}$$

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

~~$$= \frac{9\sqrt{x}}{2} - \frac{6}{x^3} - 6$$~~

$$= 4.5x^{1/2} - 6x^{-3} - 6$$

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maths 907 2nd test

P2

iv $y = \sec^3 4x$

?

?

v $y = x + \sin 2x$

~~$x + \pi \cos 2x$~~
90

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

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

~~$y' = \frac{2(10x+3)}{(2x-1)^3}$~~

$\frac{2(10x+3)}{(2x-1)^3}$

b. $y = \frac{1}{x} + \cos 2x$

$$\frac{d^5 y}{dx^5}$$

1 $x^{-2} - \sin 2x$

2 $2x^{-3} - 4 \cos 2x$

3 $-6x^{-4} 8 \sin 2x$

4 $24x^{-5} 16 \cos 2x$

5 $-120x^{-6} - 32 \sin 2x$

$$\frac{d^5 y}{dx^5} = -120x^{-6} - 32 \sin 2x$$

2/4

c. $f(x) = \ln(\operatorname{cosec} x - \cot x) \quad f'(x) = \operatorname{cosec} x$

2.

a

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

$= \ln(3x^2 + 4)$

3

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

$$= 2e^2 - 2$$

$$= 12.778$$

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

$$= -\ln 54$$

$$= 3.989$$

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

$$f'(x) = 2 \tan^{-1}(2 \ln x) + C$$

$$c. i \int_{\ln 2}^{\ln 5} \frac{3e^{2x}}{\sqrt{e^x - 1}} dx = 20$$

$$ii \int_1^e \ln x dx = 1$$

L. Malcolm Maths 2nd test P5

Q3 into $a + ib$

a

$$i \left(\frac{1+i}{1-i} \right)^3 = -i \quad A=0$$

$$\frac{i}{(1+i)(2+i)} = \frac{3}{10} - \frac{9}{10}i$$

$a = \frac{3}{10} \quad b = -\frac{9}{10}$

$$\frac{i}{1-i} \frac{1+i}{1-i} - (1+2i)(2+2i) + \frac{3-i}{1+i} = 3-7i$$

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

$A = \sqrt{3}$
 $B = -3$

$\downarrow$
 $1-i$

b. Polar $(4+7i)(3-2i)$

$$= 13\sqrt{5} \angle \tan^{-1} \frac{1}{2}$$

c. Quotient $1+3i$ and $1+i$

$$\frac{z_1}{z_2} = \frac{1+3i}{1+i} = \frac{4}{2} = 2$$

$\downarrow$
 $= 2i$