

Topical questions | 39 questions

1. Question part 1/2 | 9231 May-June 2020 P2 V1 Q6

(a) Find the exact value of I_1 . [2]

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.....

$$nI_{n+2} = 2^{n-1}3^{-\frac{1}{2}n} + (n-1)I_n. \quad [5]$$
[illegible]

9231 Further Mathematics Paper 2 - Differentiation

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1. Question part 2/2 | 9231 May-June 2020 P2 V1 Q6

- (c) Find the exact value of I_5 giving the answer in the form $k\sqrt{3}$, where k is a rational number to be determined. [3]

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6 The integral I_n , where n is an integer, is defined by $I_n = \int_0^{\frac{1}{2}} (1-x^2)^{-\frac{1}{2}n} dx$.

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.....

.....

$$nI_{n+2} = 2^{n-1}3^{-\frac{1}{2}n} + (n-1)I_n. \quad [5]$$
[illegible]

9231 Further Mathematics Paper 2 - Differentiation

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2. Question part 2/2 | 9231 May-June 2020 P2 V2 Q6

- (c) Find the exact value of I_5 giving the answer in the form $k\sqrt{3}$, where k is a rational number to be determined. [3]

[illegible]

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1 (a) By differentiating e^{-x^2} , find the Maclaurin's series for e^{-x^2} up to and including the term in x^2 . [5]

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- (b) Deduce an approximation to $\int_0^{\frac{1}{5}} e^{-x^2} dx$, giving your answer as a rational fraction in its lowest terms. [2]

[illegible]

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4. Question | 9231 Oct-Nov 2020 P2 V2 Q1

- 1** Find the Maclaurin's series for $\tan\left(x + \frac{1}{4}\pi\right)$ up to and including the term in x^2 . [5]

[illegible]

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5 The curve C has equation

(a) Show that, at the point $(1, 1)$ on C , $\frac{dy}{dx} = -\frac{2}{3}$. [3]

[illegible]

(b) Find the value of $\frac{d^2y}{dx^2}$ at the point (1, 1). [5]

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1 (a) By differentiating e^{-x^2} , find the Maclaurin's series for e^{-x^2} up to and including the term in x^2 . [5]

[illegible]

- (b) Deduce an approximation to $\int_0^{\frac{1}{5}} e^{-x^2} dx$, giving your answer as a rational fraction in its lowest terms. [2]

[illegible]

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7. Question part 1/2 | 9231 May-June 2021 P2 V1 Q7

Express $\cosh y$ in terms of x and hence show that $\sinh y \frac{dy}{dx} = -\frac{1}{\left(x + \frac{1}{2}\right)^2}$. [3]

[illegible]
$$\ln a + bx + cx^2,$$

where a , b and c are constants to be determined. [7]

[illegible]

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7. Question part 2/2 | 9231 May-June 2021 P2 V1 Q7

[illegible]

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2 The variables x and y are related by the differential equation

$$\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 2x + 1.$$

- (a) Find the general solution for y in terms of x . [6]

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- (b) State an approximate solution for large positive values of x . [1]

.....

.....

.....

Express $\cosh y$ in terms of x and hence show that $\sinh y \frac{dy}{dx} = -\frac{1}{\left(x + \frac{1}{2}\right)^2}$. [3]

[illegible]
$$\ln a + bx + cx^2,$$

where a , b and c are constants to be determined. [7]

[illegible]

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9. Question part 2/2 | 9231 May-June 2021 P2 V2 Q7

[illegible]

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3 The curve C has equation

(a) Show that, at the point $(-1, 1)$ on C , $\frac{dy}{dx} = 11$. [3]

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11. Question part 2/2 | 9231 Oct-Nov 2021 P2 V1 Q3

(b) Find the value of $\frac{d^2y}{dx^2}$ at the point $(-1, 1)$.

[5]

[illegible]

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12. Question | 9231 Oct-Nov 2021 P2 V2 Q2

2 Find the solution of the differential equation

$$\frac{dy}{dx} + \frac{4x^3 y}{x^4 + 5} = 6x$$

for which $y = 1$ when $x = 1$. Give your answer in the form $y = f(x)$. [7]

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5 The curve C has parametric equations

where a and b are constants.

Show that $\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2 = \frac{25}{4}(t^2 + t^{-2})^2$ and find the exact length of C . [6]

[illegible]

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13. Question part 2/2 | 9231 Oct-Nov 2021 P2 V2 Q5

(b) It is given instead that $a = b = 0$.

Find the value of $\frac{d^2y}{dx^2}$ when $t = 1$.

[4]

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15. Question part 1/2 | 9231 Oct-Nov 2021 P2 V3 Q3

3 The curve C has equation

$$xy^3 - 4x^3y = 3.$$

(a) Show that, at the point $(-1, 1)$ on C , $\frac{dy}{dx} = 11$. [3]

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15. Question part 2/2 | 9231 Oct-Nov 2021 P2 V3 Q3

(b) Find the value of $\frac{d^2y}{dx^2}$ at the point $(-1, 1)$.

[5]

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5 The variables x and y are such that $y = 0$ when $x = 0$ and

(a) Show that $\frac{dy}{dx} = -\frac{3}{4}$ when $x = 0$. [3]

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(b) Find the Maclaurin's series for y up to and including the term in x^2 . [7]

[illegible]

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16. Question part 2/2 | 9231 May-June 2022 P2 V1 Q5

[illegible]

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5 The variables x and y are such that $y = 0$ when $x = 0$ and

(a) Show that $\frac{dy}{dx} = -\frac{3}{4}$ when $x = 0$. [3]

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(b) Find the Maclaurin's series for y up to and including the term in x^2 . [7]

[illegible]

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17. Question part 2/2 | 9231 May-June 2022 P2 V2 Q5

[illegible]

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18. Question | 9231 May-June 2022 P2 V3 Q2

- 2 (a)** Find the coefficient of x^2 in the Maclaurin's series for $-\ln \cos x$. [4]

[illegible]

- (b)** Find the length of the arc of the curve with equation $y = -\ln \cos x$ from the point where $x = 0$ to the point where $x = \frac{1}{4}\pi$. [4]

[illegible]

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4 It is given that

(a) Show that $\frac{dy}{dx} = -\frac{t^2 + 1 + \sqrt{t^2 + 1}}{t^2}$. [4]

[illegible]

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19. Question part 2/2 | 9231 May-June 2022 P2 V3 Q4

(b) Find the value of $\frac{d^2y}{dx^2}$ when $t = \frac{3}{4}$.

[5]

[illegible]

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20. Question | 9231 Oct-Nov 2022 P2 V1 Q1

- 1** Find the Maclaurin's series for $\ln(1 + e^x)$ up to and including the term in x^2 . [5]

[illegible]

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2 A curve has equation

(a) Show that $\frac{dy}{dx} = -\frac{2}{3}$ at the point $(0, -2)$. [3]

[illegible]

(b) Find the value of $\frac{d^2y}{dx^2}$ at the point $(0, -2)$. [4]

[illegible]

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1 (a) Find the Maclaurin series for $\sin^{-1}x$ up to and including the term in x^3 . [5]

[illegible]

- (b)** Deduce an approximation to $\int_0^{\frac{1}{5}} \frac{1}{\sqrt{1-u^2}} du$, giving your answer as a fraction. [1]

[illegible]

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4 The curve C has equation

(a) Show that, at the point $(-4, 3)$ on C , $\frac{dy}{dx} = \frac{1}{17}$. [3]

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(b) Find the value of $\frac{d^2y}{dx^2}$ at the point $(-4, 3)$.

[5]

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25. Question | 9231 Oct-Nov 2023 P2 V1 Q3

- 3** Find the first three terms in the Maclaurin's series for $\tanh^{-1}\left(\frac{1}{2}e^x\right)$ in the form $\frac{1}{2}\ln a + bx + cx^2$, giving the exact values of the constants a , b and c . [6]

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26. Question | 9231 Oct-Nov 2023 P2 V2 Q1

1 Find the Maclaurin's series for $\ln(x+2) + \ln(x^2+5)$ up to and including the term in x^2 . [5]

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27. Question | 9231 Oct-Nov 2023 P2 V2 Q2

2 It is given that

$$x = 1 + \frac{1}{t} \quad \text{and} \quad y = te^t.$$

(a) Show that $\frac{dy}{dx} = -e^t(t^3 + t^2)$. [3]

[illegible]

(b) Find $\frac{d^2y}{dx^2}$ in terms of t . [4]

[illegible]

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28. Question | 9231 Oct-Nov 2023 P2 V3 Q3

- 3** Find the first three terms in the Maclaurin's series for $\tanh^{-1}\left(\frac{1}{2}e^x\right)$ in the form $\frac{1}{2}\ln a + bx + cx^2$, giving the exact values of the constants a , b and c . [6]

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29. Question | 9231 May-June 2024 P2 V1 Q2

2 Find the Maclaurin's series for $e^{1+x^2} + e^{1-x}$ up to and including the term in x^2 . [4]

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3 It is given that

(a) Show that $\frac{dy}{dx} = -t + \sqrt{1-t^2} \cos^{-1} t$. [3]

[illegible]

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(b) Find $\frac{d^2y}{dx^2}$ in terms of t . [4]

[illegible]

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31. Question | 9231 May-June 2024 P2 V2 Q2

2 Find the Maclaurin's series for $e^{1+x^2} + e^{1-x}$ up to and including the term in x^2 .

[illegible]

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32. Question part 1/2 | 9231 May-June 2024 P2 V2 Q3

3 It is given that

$$x = \sin^{-1}t \quad \text{and} \quad y = t \cos^{-1}t, \quad \text{for } 0 \leq t < 1.$$

(a) Show that $\frac{dy}{dx} = -t + \sqrt{1-t^2} \cos^{-1} t$. [3]

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32. Question part 2/2 | 9231 May-June 2024 P2 V2 Q3

(b) Find $\frac{d^2y}{dx^2}$ in terms of t . [4]

[illegible]

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33. Question part 1/2 | 9231 May-June 2024 P2 V3 Q3

3 The curve C has equation

$$x^3 + 2xy + 8y^3 = -12.$$

(a) Show that, at the point $(-2, -1)$ on C , $\frac{dy}{dx} = -\frac{1}{2}$. [3]

[illegible]



[5]

[illegible]

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34. Question part 1/2 | 9231 Oct-Nov 2024 P2 V1 Q2

$$x = 1 + \frac{1}{t} \quad \text{and} \quad y = \cos^{-1} t \quad \text{for } 0 < t < 1.$$

(a) Show that $\frac{dy}{dx} = \frac{t^2}{\sqrt{1-t^2}}$. [2]

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[illegible][illegible]

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35. Question part 1/2 | 9231 Oct-Nov 2024 P2 V2 Q2

$$4y^2 + 4 \ln(xy) = 1.$$

(a) Show that, at the point $\left(2, \frac{1}{2}\right)$ on C , $\frac{dy}{dx} = -\frac{1}{6}$. [3]

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[illegible]

[4]

[illegible]

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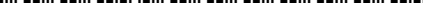
36. Question part 1/2 | 9231 Oct-Nov 2024 P2 V3 Q2

$$x = 1 + \frac{1}{t} \quad \text{and} \quad y = \cos^{-1} t \quad \text{for } 0 < t < 1.$$

(a) Show that $\frac{dy}{dx} = \frac{t^2}{\sqrt{1-t^2}}$. [2]

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[illegible]

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4 A curve has parametric equations

$$x = t^3 - t^2 + t - 1 \quad \text{and} \quad y = te^t.$$

(a) Show that 1 is the only real value of t for which $x = 0$. [1]

[illegible]

(b) Show that $\frac{dy}{dx} = \frac{(t+1)e^t}{3t^2-2t+1}$. [3]

[illegible]

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38. Question part 2/2 | 9231 May-June 2025 P2 V4 Q4



(c) Find the Maclaurin's series for y up to and including the term in x^2 .

[6]

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39. Question part 1/2 | 9231 Oct-Nov 2025 P2 V2 Q3

3 The variables x and y are such that $y = 2$ when $x = -1$ and

$$x^2y + (x+y)^3 = 3.$$

(a) Show that $\frac{dy}{dx} = \frac{1}{4}$ when $x = -1$. [3]

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[6]

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