Name:

Level 2 Further Maths

Differentiation

Corbettmaths

Ensure you have: Pencil or pen

Guidance

1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

Revision for this topic

www.corbettmaths.com/more/further-maths/

1. $y = 7x^2$

Work out $\frac{dy}{dx}$

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

(2)

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2. $y = 3x^3 - 8x$

Work out $\frac{dy}{dx}$

$\frac{dy}{dx} =$ $9x^2 - 8$

(2)

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3. $y = 8x^3 + x - 4$

Work out $\frac{dy}{dx}$

$\frac{dy}{dx} =$ $24x^2 + 1$

(3)

4. $y = x^7 - 3x^6$

Work out $\frac{dy}{dx}$

$\frac{dy}{dx} =$ $7x^6 - 18x^5$

(3)

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5. $y = (x + 4)(x + 2)$

Work out $\frac{dy}{dx}$

$y = x^2 + 6x + 8$

$\frac{dy}{dx} =$ $2x + 6$

(3)

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6. $y = 5x^2 - 3x + 7$

Find the value of $\frac{dy}{dx}$ when $x = 1$

$\frac{dy}{dx} = 10x - 3$

$x = 1 \quad \frac{dy}{dx} = 7$

$\frac{dy}{dx} =$ 7

(3)

7. $y = x^3(x - 4)$

Work out $\frac{dy}{dx}$

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

$\frac{dy}{dx} =$ $4x^3 - 12x^2$

(3)

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8. $y = (3x - 2)^2$

Work out $\frac{dy}{dx}$

$y = 9x^2 - 12x + 4$

$\frac{dy}{dx} =$ $18x - 12$

(3)

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9. $y = \frac{x^9}{3} + \frac{x^4}{4}$

Work out $\frac{dy}{dx}$

$y = \frac{1}{3}x^9 + \frac{1}{4}x^4$

$\frac{dy}{dx} =$ $3x^8 + x^3$

(3)

10. $y = x^3 + 4x^2 + 2$

When $x = -2$, show that the value of $\frac{dy}{dx}$ is -4

$\frac{dy}{dx} = 3x^2 + 8x$

$x = -2$

$3(-2)^2 + 8(-2)$

$3 \times 4 - 16$

$12 - 16 = -4$

(3)

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11. $y = (1 - 2x)(3 - x)$

Work out $\frac{dy}{dx}$

$y = 3 - x - 6x + 2x^2$

$y = 3 - 7x + 2x^2$

$\frac{dy}{dx} = -7 + 4x$

$\frac{dy}{dx} =$ $4x - 7$

(3)

12. $y = (x^4 - 3)^2$

Work out $\frac{dy}{dx}$

$y = (x^4 - 3)(x^4 - 3)$

$y = x^8 - 6x^4 + 9$

$\frac{dy}{dx} =$ $8x^7 - 24x^3$

(4)

13.. $y = \frac{3}{x^2}$

$y = 3x^{-2}$

$\frac{dy}{dx} =$ $-6x^{-3}$ or $-\frac{6}{x^3}$

(2)

14. $y = \dfrac{3x^3(x^2 - 4x)}{x}$

Work out $\dfrac{dy}{dx}$

$y = \dfrac{3x^5 - 12x^4}{x}$

$y = 3x^4 - 12x^3$

$\dfrac{dy}{dx} =$ $12x^3 - 36x^2$

(4)

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15. $y = \dfrac{4x(x^3 - 2x)}{x^2}$

Work out $\dfrac{dy}{dx}$

$y = \dfrac{4x^4 - 8x^2}{x^2}$

$y = 4x^2 - 8$

$\dfrac{dy}{dx} =$ $8x$

(3)

16. $y = 9x^4 - \frac{4}{x^3}$

Work out $\frac{dy}{dx}$

$y = 9x^4 - 4x^{-3}$

$\frac{dy}{dx} = 36x^3 + 12x^{-4}$

$\frac{dy}{dx} = 36x^3 + \frac{12}{x^4}$

$\frac{dy}{dx} =$ $36x^3 + \frac{12}{x^4}$

(3)

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17. $y = \frac{3}{5}x^{10} + 3x^6$

Work out $\frac{dy}{dx}$

$\frac{dy}{dx} =$ $6x^9 + 18x^5$

(3)

18. $y = (\sqrt{x})^{10}$

Work out $\frac{dy}{dx}$

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

$y = x^5$

$\frac{dy}{dx} =$ $5x^4$

(3)

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19. $y = 2x^{\frac{3}{2}}(x^{\frac{1}{2}} + x^{\frac{9}{2}})$

Work out $\frac{dy}{dx}$

$y = 2x^2 + 2x^6$

$\frac{dy}{dx} =$ $4x + 12x^5$

(4)

20. $y = 4x^2 + px$ where p is a constant

The value of $\frac{dy}{dx}$ when $x = 3$ is five times the value of $\frac{dy}{dx}$ when $x = -1$

Work out the value of p

$\frac{dy}{dx} = 8x + p$

$x = 3 \quad \frac{dy}{dx} = 24 + p$

$x = -1 \quad \frac{dy}{dx} = -8 + p$

$5(-8 + p) = 24 + p$

$-40 + 5p = 24 + p$

$4p = 64$

$p =$

$p =$ 16

(5)

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21. $y = \frac{3x^4 + 8x}{2x}$

Work out the possible values of x when $\frac{dy}{dx} = 882$

$y = \frac{3}{2}x^3 + 4$

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

$\frac{9}{2}x^2 = 882$

$x^2 = 196$

$x =$ 14 or −14

(5)