

(C1-7.1) Name:

Homework Questions 1 – Calculating an Estimate of a Gradient

1. A is the point with coordinates (3,1) on the curve $Y = (X - 2)^2$

Find the gradients of the chords joining A to:

a) Point B (4,4)

b) Point C (3.5, 2.25)

c) Point D (3.3, 1.69)

d) Point E (3.1, 1.21)

e) Point F (3.01, 1.0201)

f) Point G (3.001, 1.002001)

2. What do you deduce about the gradient of the tangent at the point (3,1) and explain why?

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Homework Questions 2 – Finding the Derived Function

Differentiate the following, leave your answer in index form

1. $f(x) = x^2$

2. $f(x) = x^{-2}$

3. $f(x) = x^{-6}$

4. $f(x) = x^{\frac{1}{4}}$

5. $f(x) = \sqrt[4]{x}$

6. $f(x) = \sqrt[6]{x}$

7. $f(x) = \frac{1}{x^4}$

8. $f(x) = \frac{1}{x^5}$

9. $f(x) = \frac{1}{\sqrt[4]{x}}$

10. $f(x) = \frac{1}{\sqrt[6]{x}}$

11. $f(x) = \frac{x^5}{x^2}$

12. $f(x) = \frac{x^7}{x^3}$

13. $f(x) = \frac{x^2}{x^5}$

14. $f(x) = \frac{x}{x^3}$

15. $f(x) = x^2 \times x^5$

16. $f(x) = x^4 \times x^5$

17. $f(x) = 5x^4$

18. $f(x) = 2x^3$

19. $f(x) = \frac{3}{x^2}$

20. $f(x) = \frac{5}{\sqrt[3]{x^2}}$

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Homework Questions 3 – Gradient Function

$\frac{dy}{dx}$

1. Find $\frac{dy}{dx}$ when y equals:

a) $y = 7x + 2$

b) $y = 5x^2 + 6x$

c) $y = 8x^2 + 2x + 3$

d) $y = 7x^2 + x + 2$

e) $y = 10x^2 + 3x + 4$

f) $y = \frac{x^2}{2} + 6x - 1$

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

h) $y = 8x^2 + 4x - 3$

i) $y = 2x^2 + 3x - 1$

J) $y = 6x^2 + 2x + 4$

2. Find the gradient of the following curves at the given points

a) $y = 4x^2$ at the point (2,16)

b) $y = 2x^2 - 3x + 1$ at the point (1,0)

c) $y = 5 - x^2 - 4x$ at the point (-1,8)

d) $y = \frac{x^2}{2} + 5x - 6$
at the point (2,6)

e) $y = \frac{2x^2}{3} + 4x - 10$
at the point (3,8)

3. The curve $y = 2x^2 + 4x - 12$ meets the line $y=4$ at the points A and B

a) Find the coordinates of A and B

b) Find the gradient of the curve at the point A

c) Find the gradient of the curve at the point B

d) Find the gradient of the line joining A to B

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Homework Questions 4 – Using Standard Results to Differentiate

1. Use standard results to differentiate the following

a) $y = x^3 + 2x^2$

b) $y = \frac{x^{-3}}{2}$

c) $y = 3x^{-\frac{1}{2}}$

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

e) $y = 5x^2 + 3x^{-\frac{1}{3}} + 2$

f) $y = 3x^2 - 2x^{-1} + 5$

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

h) $y = 8x^2 + 4x - 3$

i) $y = 2x^2 + 3x - 1$

j) $y = 6x^2 + 2x + 4$

2. Find the gradient of the following curves at the given points

a) $f(x) = \frac{1}{x^2}$ at the point (2 , 0.25)

b) $f(x) = \frac{5}{\sqrt{x}}$ at the point where x=9

3. Find the coordinate of the point on the curve

a) $y = x^2 - 3x + 1$ where the gradient is 7

b) $f(x) = 4x^2 - 7x + 3$ where the gradient is -3

c) $f(x) = x^2 + 5x + 3$ where the gradient is 1

d) $y = 7x - 3x^2$ where the gradient is -5

4. Find the coordinate of both points on the curve $y = x - \frac{x^3}{3}$ where the gradient is 0

5. Find the coordinate of both points on the curve $y = x^3 - 9x^2 + 10x - 5$ where the gradient is -14

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Homework Questions 5 – Expanding and Simplifying

Use standard results to differentiate after first expanding or simplifying the function

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

2. $f(x) = x(x + 1)$

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

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

5. $y = 3(x - 1)(x + 2)$

6. $f(x) = 2x^2(4x - 3)$

7. $f(x) = \frac{12x^5}{6x}$

8. $y = \frac{x^2 - x}{x}$

9. $y = \frac{3x^2 - 4x}{x}$

10. $f(x) = \frac{3x^4 + 4x^2 + 6x}{2x}$

11. $f(x) = \sqrt[3]{x}$

12. $y = \sqrt[4]{x}$

13. $y = 3x - \sqrt{x} + x^2$

14. $f(x) = \frac{x^2 + x}{\sqrt{x}}$

15. $f(x) = \frac{3x^4 - 2x^2}{\sqrt[3]{x}}$

16. $f(x) = -\frac{2}{\sqrt{x}}$

17. $y = \frac{x^2 - 3x}{2x^4}$

18. $y = x^3 - \frac{1}{2x^2} + \frac{4}{x^3}$

19. $f(x) = (2x - 3)(x - 4)$

20. $f(x) = (x + 4)^2 + 2x^2$

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Homework Questions 6 - 2nd Order Derivatives

For each questions find the 2nd order derivative

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

2. $f(x) = 4x^3 - 2x$

3. $f(x) = 8x^2 - 5x - 3$

4. $y = \sqrt{x} + x^2$

5. $y = \frac{1}{x^2} + \frac{1}{x^3}$

6. $f(x) = 6 - 5x + \frac{7}{x}$

7. $f(x) = 6\sqrt{x} - \frac{4}{x^2}$

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

9. $y = (x + 6)^2$

10. $f(x) = \frac{x^2}{3} - 2x^2 + x - \sqrt{x} + 5$

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Homework Questions 7 - Rate of Change

For the rate of change of the following by differentiating

1. find $\frac{d\theta}{dt}$ where $\theta = t^3 - 4t + 6$

2. find $\frac{dx}{dy}$ where $x = 7y^2 - 3y + 2$

3. find $\frac{dr}{dt}$ where $r = 3t^2 - 2t + 1$

4. find $\frac{da}{dr}$ where $a = \pi r^2$

5. find $\frac{dt}{dy}$ where $t = y^2(y + 3)$

6. find $\frac{ds}{dt}$ where $s = 7t^2 - 6t$

7. find $\frac{da}{dx}$ where $a = 8x^3 - 2x^2 - 3$

8. find $\frac{dy}{dx}$ where $y = 5x^2 - \frac{1}{x^3} + x$

9. find $\frac{dy}{dx}$ where $y = (x - 4)(2 - 3x)$

10. find $\frac{d\theta}{dt}$ where $\theta = (t + 1)(t^2 - 4)$

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Homework Questions 8 – Equation of Tangents & Normals

1. Find the equation of the tangent to the curve $y = 3x^2 + 5x + 2$ at the point (3,44)

2. For the curve given below, find the gradient of the tangent at the point (4,123)

$$y = 7x^2 + 4x - 5$$

3. Find the equation of the tangent to the function below at the point (1,11)

$$f(x) = 8x^2 + 3x$$

4. If a tangent cuts a curve at (2,7) and has a gradient of -2,
What is the equation of the tangent?

5. Find the gradient of the function at the point (2,36)

If the equation of the curve is $f(x) = 4x^2 + 9x + 2$

6. What are the coordinates of the point on the curve $y = 4 - x^2$ where the gradient of
the normal is $\frac{1}{4}$

7. Find the equation of the normals to the curve $y = x^2 - 5$ at the point (2,-1)

8. What is the equation of the tangent to the curve $y = 3x^2 - 9x$ at the point where $x=4$

9. What is the equation of the normal to the curve $y = x - x^2 + 2x^3$ at the point where $x=-1$

10. Find the equation of the normal to the curve $y = x^2 + 5x + 1$ at the point where the tangent gradient at this point is 2