MEMORANDUM

Name: ..... Class: .....

Date: .....

MARK ____ / 14

Answer all questions. Show all your working — marks are awarded for method as well as the final answer. **Teacher copy: accept any correct equivalent method.**

1 Determine the average gradient of $f(x) = x^2 + 1$ between $x = 1$ and $x = 3$. (2)

$\frac{10 - 2}{3 - 1} = 4$ ✓✓ (2)

2 Determine the average gradient of $f(x) = x^2 + 1$ between $x = -1$ and $x = 2$. (2)

$\frac{5 - 2}{2 + 1} = 1$ ✓✓ (2)

3 Write down the formula for average gradient between $x = a$ and $x = b$. (1)

$\frac{f(b) - f(a)}{b - a}$ ✓ (1)

4 Is the average gradient the same as the gradient at a point? Explain. (2)

No — it is the gradient of the straight line joining two points; the gradient at a point is the gradient of the tangent there. ✓✓ (2)

5 Determine the average gradient of $f(x) = x^2$ between $x = 2$ and $x = 2{,}001$ (three decimals). (3)

4,001... which tends to 4 as the interval shrinks ✓✓✓ (3)

6 What does the average gradient become as the two points move together? (1)

The **derivative** — the gradient of the tangent at that point. ✓ (1)

7 A car travels 240 km in 3 hours. What is its average rate of change of distance? (1)

$\frac{240}{3} = 80$ **km/h** ✓ (1)

8 Determine the average gradient of $f(x) = 2x + 5$ between any two points. (2)

2 — for a straight line the average gradient is the same everywhere. ✓✓ (2)

TOTAL: 14 marks

© Danemathics — free to print and share for classroom use.