MEMORANDUM

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

Date: .....

MARK ____ / 18

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 A rectangle has a perimeter of 40 m. Determine its maximum possible area. **(4)**

> $A = x(20 - x)$, $A' = 20 - 2x = 0 \rightarrow x = 10 \rightarrow$ **100 m²** ✓✓✓✓ (4)

2 The height of a ball is $s(t) = 20t - 5t^2$. Determine its velocity after 1 second. **(2)**

> $v(t) = 20 - 10t \rightarrow v(1) =$ **10 m·s^{-1}** ✓✓ (2)

3 For the same ball, determine when it reaches its maximum height. **(2)**

> $v = 0 \rightarrow 20 - 10t = 0 \rightarrow$ **$t = 2$ s** ✓✓ (2)

4 For the same ball, determine its maximum height. **(2)**

> $s(2) = 40 - 20 =$ **20 m** ✓✓ (2)

5 For the same ball, determine its velocity when it strikes the ground. **(3)**

> $s = 0$ at $t = 4 \rightarrow v(4) =$ **−20 m·s^{-1}** ✓✓✓ (3)

6 Determine the acceleration of the ball. **(2)**

> $a(t) = v'(t) =$ **−10 m·s^{-2}** (constant) ✓✓ (2)

7 Why must you use the constraint before differentiating? **(2)**

> The quantity must be written in terms of **one variable** before you can find where its derivative is zero ✓; the constraint is what lets you replace the second variable ✓ (2)

8 What does a negative velocity tell you? **(1)**

> The object is moving in the **opposite direction** (downwards, here). ✓ (1)

TOTAL: 18 marks

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