**COLLISIONS WITH SURFACES IN 2-DIMENSIONS**

**SOLUTIONS**

|  |  |  |
| --- | --- | --- |
| **1.** |  |  |
|  | First impact: |  |
|  | Component parallel to wall: | B1 |
|  | Perp to wall: NLR: | M1 A1 |
|  |  | A1 |
|  | Second impact: |  |
|  | parallel to wall vel after | B1 |
|  | Perp to wall | B1 |
|  | Direction at  to the wall | B1 |
|  | or | M1 |
|  | or | A1 |
|  |  | A1 |
|  |  | **[9]** |

|  |  |  |
| --- | --- | --- |
| **2a** | Resolve parallel to barrier - condone sin/cos confusion | M1 |
|  |  | A1 |
|  | Resolve perpendicular to the barrier - condone consistent sin/cos confusion. Use *e* correctly | M1 |
|  |  | A1 |
|  |  | M1 |
|  |  | A1 |
|  |  | (6) |
|  |  |  |
| **b** | Angle of approach with *BC* = | B1 |
|  |  | M1 |
|  |  | M1 |
|  |  | A1 |
|  |  |  |
|  | Form equation in *v* and | M1 |
|  |  | A1 |
|  |  | A1 |
|  |  | (7) |
|  |  | [13] |

|  |  |  |
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| **3**  **alt1** |  |  |
|  | Speed perpendicular to wall after collision = | B1 |
|  | Speed parallel to the wall is unchanged | B1 |
|  |  | M1 |
| A1 |
|  | , , | A1 |
|  | direction deflected by | M1 |
| A1 |
|  | (104) | A1  [8] |

|  |  |  |
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| Question Number | Scheme | Marks |
| **alt2** |  |  |
|  | Speed perpendicular to wall after collision = | B1 |
|  | Speed parallel to the wall is unchanged | B1 |
|  |  | M1 |
| A1 |
|  | , | A1 |
|  | deflected by , | M1 |
| A1 |
|  | (104) | A1  [8] |