

# MEMORIAL UNIVERSITY OF NEWFOUNDLAND

## DEPARTMENT OF MATHEMATICS AND STATISTICS

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SECTION 4.1

Math 1000 Worksheet

FALL 2024

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**For practice only. Not to be submitted.**

1. The legs of an isosceles right triangle are increasing in length at a rate of 1 mm/sec. How quickly is the size of the hypotenuse growing at the moment when its length is 5 cm?
2. A girl is flying a kite in winds that blow the kite horizontally at a speed of 8 feet per second. If the kite is 100 feet up in the air, at what rate is the angle between the kite string and the ground changing when 200 feet of string have been let out?
3. A box-shaped ice cube is melting such that each of its length, width and height decrease at the same rate of 0.5 cm/sec. Furthermore, the cube's width and height are always equal. Find the rate of the change of the ice cube's surface area at the moment when its length is 8 cm and its surface area is  $210 \text{ cm}^2$ .
4. A spotlight on the ground shines on a wall 12 metres away. If a man 2 metres tall walks from the spotlight toward the building at a speed of 1.6 metres/sec, how fast is the height of his shadow on the building shrinking when he is 4 metres from the building?
5. A boat is pulled into a dock by a rope attached to the bow of the boat. The rope passes through a pulley on the dock that is 1 metre higher than the bow of the boat. If the rope is pulled in at a rate of 1 metre per second, how fast is the boat approaching the dock when it is 8 metres from the dock? Approximate your answer to two decimal places.
6. Infamous pirate Jack Sparrow is stranded on an island — shiver me timbers! The island lies 9 km north of a shoreline which runs in a straight line, east to west. Jack sets up a makeshift distress beacon which sends out a rotating beam of light. The beacon makes 4 revolutions per minute in the counterclockwise direction. Jack's mate, Will Turner, has made camp on the shore exactly 3 km east of the point directly across from Jack's island. So, ye scallywag, how fast is the beam of light moving when it reaches Will?
7. Doctor Who runs out of a building in pursuit of a Dalek. She is travelling south and running at 10 ft/sec. Two minutes later, her friend Graham leaves the same building to chase a second Dalek. He heads east and moves at 6 ft/sec. To one decimal place, how fast are the Doctor and Graham separating five minutes after the Doctor left the building?