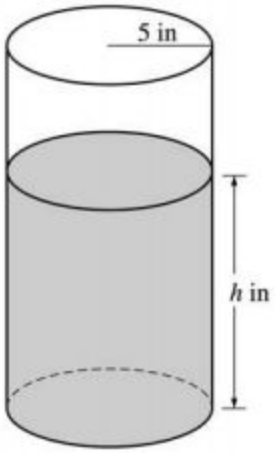
Name_____ # Related Rates FRQ Practice

1) A coffeepot that is being filled up has the shape of a cylinder with radius 5 inches, as shown in the figure to the right. Let h be the depth of the coffee in the pot, measured in inches, where h is a function of time t, measured in seconds. The rate of change of the height h of the coffee in the coffee pot with respect to time t is modeled by $\frac{dh}{dt} = 4h$, where h is measured in inches and t is measured in seconds . (The volume V of a cylinder with radius r and height h is $V = \pi r^2 h$.)

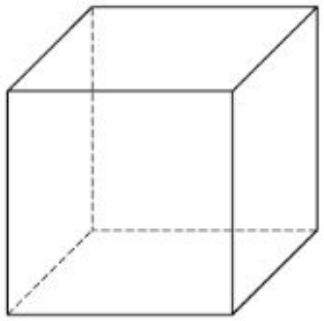


a) Find the rate of change of the volume of coffee in the coffee pot with respect to time when the height of the water is 3 inches. Indicate units of measure.

b) When the height of the water is 2 feet, what is the rate of change of the height of the water with respect to time? Indicate units of measure.

c) When the height of the water is 3 feet, is the rate of change of the height of the water with respect to time increasing or decreasing? Justify.

2) A block of ice in the shape of a cube is melting on a warm pan and remains a cube as it melts. Let S be the side length of the ice cube, measured in centimeters where S is a function of time t, measured in minutes. The rate of change of the side length S of the ice cube with respect to time t is modeled by $\frac{dS}{dt} = -\sqrt{S}$ where S is measured in centimeters and t is measured in minutes. The ice has a side length of 9 centimeters at t = 0 minutes. (The volume V of a cube with side length S is $V = S^3$.)



S

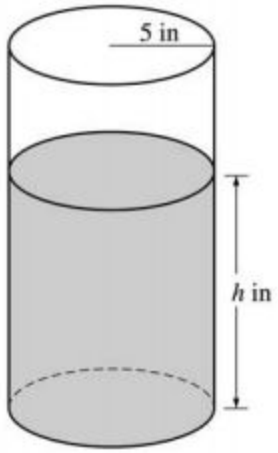
a) Is the ice cube melting at a faster rate when S = 9 centimeters or when S = 4 centimeters? Justify your answer.

b) Write an equation of the tangent line to the graph of S at t = 0 minutes. Use this tangent line to predict the side length of the ice cube at t = 2 minutes.

c) What is the rate of change of the volume of the ice cube with respect to time when S = 5 centimeters?

Name_____ Related Rates/Differential Equation Practice

1) A coffeepot that is being filled up has the shape of a cylinder with radius 5 inches, as shown in the figure to the right. Let h be the depth of the coffee in the pot, measured in inches, where h is a function of time t, measured in seconds. The rate of change of the height h of the coffee in the coffee pot with respect to time t is modeled by $\frac{dh}{dt} = 4h$, where h is measured in inches and t is measured in seconds . (The volume V of a cylinder with radius r and height h is $V = \pi r^2 h$.)



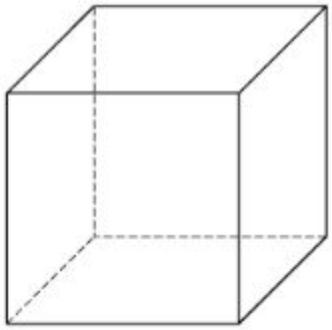
a) Find the rate of change of the volume of coffee in the coffee pot with respect to time when the height of the water is 3 inches. Indicate units of measure.

b) When the height of the coffee is 2 inches, what is the rate of change of the height of the water with respect to time? Indicate units of measure.

c) When the height of the water is 3 inches, is the rate of change of the height of the coffee with respect to time increasing or decreasing? Justify.

d) At time t = 0 seconds, the height of the coffee is 5 inches. Use separation of variables to find an expression for h in terms of t.

2) A block of ice in the shape of a cube is melting on a warm pan and remains a cube as it melts. Let S be the side length of the ice cube, measured in centimeters where S is a function of time t, measured in minutes. The rate of change of the side length S of the ice cube with respect to time t is modeled by $\frac{dS}{dt} = -\sqrt{S}$ where S is measured in centimeters and t is measured in minutes. The ice has a side length of 9 centimeters at t = 0 minutes. (The volume V of a cube with side length S is $V = S^3$.)



a) Is the ice cube melting at a faster rate when S = 9 centimeters or when S = 4 centimeters? Justify your answer.

b) Write an equation of the tangent line to the graph of S at t = 0 minutes. Use this tangent line to predict the side length of the ice cube at t = 4 minutes.

c) What is the rate of change of the volume of the ice cube with respect to time when S = 5 centimeters?

d) At time t = 0 seconds, the side length of the ice cube is 9 centimeters. Use separation of variables to find an expression for S in terms of t.