**Instructions:** You may not use a calculator, notes, books or any other aids. Answer each of the questions thoroughly, justifying your responses and simplifying your final answers where appropriate. Justifying your responses means that you must show your work. Be sure that the notation you use makes mathematical sense.

1. Fill in the correct number (using the numbers 1 through 5) according to what step in the process of solving a related rates question the given statement is.

   1. Draw and label a diagram.
   2. Specify the quantities that you are seeking and the quantities that you are given.
   3. Find an equation involving the quantities that you are seeking and the quantities you are given.
   4. Implicitly differentiate.
   5. Solve for the final answer.

2. Each edge of a cube is growing at a rate of 2 inches per second. What is the rate of change of the volume of the cube when the edges are 10 inches long? To receive full credit for this question, be sure to do each of the five steps listed above labelling each portion with its respective step number.

   ![Diagram of a cube](image)

   **Given:** \( \frac{dx}{dt} = 2 \text{ in/sec} \)
   
   **Want:** \( \frac{dV}{dt} \bigg|_{x=10 \text{ in}} \)

   \( V = x^3 \)

   \( \frac{d}{dx}(V) = \frac{d}{dx}(x^3) \)

   \( \Leftrightarrow \frac{dV}{dt} = 3x^2 \cdot \frac{dx}{dt} \)

   \( \frac{dV}{dt} \bigg|_{x=10 \text{ in}} = 3 \cdot (10 \text{ in})^2 \cdot 2 \text{ in/sec} = 600 \text{ in}^3 \text{/sec} \)
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1. Tell whether each of the following statements is TRUE or FALSE.
   
   a. TRUE / FALSE \( \frac{d}{dx} (f(x)g(x)) = f(x)g'(x) + f'(x)g(x) \)

   b. TRUE / FALSE \( \frac{d}{dx} \left( \frac{f(x)}{g(x)} \right) = \frac{g(x)f'(x) + f(x)g'(x)}{(g(x))^2} \)

   c. TRUE / FALSE \( \frac{d}{dx} (\sin(x)) = -\cos(x) \)

   d. TRUE / FALSE \( \sqrt{a+b} = \sqrt{a} + \sqrt{b} \) \( \sqrt{2} = \sqrt{1+1} \neq \sqrt{1} + \sqrt{1} = 2 \)

   e. TRUE / FALSE \( \cos(x+y) = \cos(x) + \cos(y) \) \( \cos(x+y) = \cos(x)\cos(y) - \sin(x)\sin(y) \)

   f. TRUE / FALSE \( \sin(4x) = 4\sin(x) \)

   g. TRUE / FALSE \( f'(x) = \lim_{h \to 0} \frac{f(c+h) - f(c)}{h} \) \( f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} \)

   h. TRUE / FALSE \( x^2 + 4 = (x+2)(x-2) \)

   i. TRUE / FALSE \( \frac{d}{dx} \left( \frac{1}{x^5} \right) = -\frac{1}{5x^6} \)

   j. TRUE / FALSE If \( \lim_{x \to c} f(x) = \infty \) then \( \lim_{x \to c} f(x) = DNE. \)