The two shortest sides of a right triangle are measured as 3 cm and 4 cm respectively, with a possible error of 0.02 cm. Use differentials to approximate the maximum error in the calculated value of (a) the hypotenuse; (b) the area of the triangle.
The total resistance $R$ of three resistances $R_1$, $R_2$, and $R_3$ connected in parallel is given by \( \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \). If measurements of $R_1$, $R_2$, and $R_3$ are 100, 200, and 400 ohms, respectively, with a maximum error of 1% in each measurement, approximate the maximum error in the calculated value of $R$. 
An open cylindrical tin can has diameter 3 in. and altitude 4 in. Use differentials to approximate the amount of tin in the can if the can is 0.015 in. thick.
The specific gravity of an object is given by 
\[ s = \frac{A}{(A - w)} \]
where \( A \) and \( W \) are the weights of the object in air and water, respectively. If measurements are \( A = 12 \) lb and \( W = 5 \) lb with maximum errors of \( 1/2 \) oz in air and \( 1 \) oz in water, what is the maximum error in the calculated value of \( s \)?
The pressure $P$, volume $V$, and temperature $T$ of a confined gas are related by $PV = kT$, where $k$ is a constant. If $P = 0.5$ lb/in$^2$ when $V = 64$ in$^3$ and $T = 80^\circ$, approximate the change in $P$ if $V$ and $T$ change to 70 in$^3$ and 76$^\circ$, respectively.
The electrical resistance $R$ of a wire is directly proportional to its length and inversely proportional to the square of its diameter. If the length is measured with a possible error of 1% and the diameter is measured with a possible error of 3%, what is the maximum percentage error in the calculated value of $R$?
Approximate the change in area of an isoceles triangle if each of the two equal sides increases from 100 to 101 and the angle between them decreases from \(.333\pi\) to \(.330\pi\).
The radius and altitude of a right circular cylinder are measured as 3 in and 8 in, respectively, with a possible error in measurement of \( \pm 0.05 \) in. Use differentials to approximate the maximum error in the calculated volume of the cylinder.
The radius and altitude of a right circular cylinder are measured as 3 in and 8 in, respectively, with a possible error in measurement of ± 0.05 in. Use differentials to approximate the maximum error in the calculated surface area of the cylinder.
Suppose the dimensions in inches of a rectangular parallelepiped change from 9, 6, and 4, to 9.02, 5.97, and 4.01, respectively. Use differentials to approximate the change in total surface area.
The radius $r$ and altitude $h$ of a right circular cylinder are increasing at rates of 0.01 in/min and 0.02 in/min respectively. Use the Chain Rule to find the rate at which the volume is increasing at the time when $r = 4$ and $h = 7$ in. At what rate is the lateral surface area changing at this time?
A certain gas obeys the Ideal Gas Law $PV = 8T$. Suppose that the gas is being heated at a rate of $2^\circ/\text{min}$ and the pressure is increasing at a rate of $1/2(\text{lb/in}^2)/\text{min}$. If, at a certain instant, the temperature is $200^\circ$ and the pressure is $10\text{lb/in}^2$, use the Chain Rule to find the rate at which the volume is changing.
Sand is leaking out of a hole in a container at a rate of 6 in$^3$/min. As it leaks out it forms a pile in the shape of a right circular cone whose base radius is increasing at a rate of 1/4 in/min. If, at the instant that 40 in$^3$ has leaked out, the radius is 5 in, use the Chain Rule to find the rate at which the height of the pile is increasing.
The equal sides and included angle of an isosceles triangle are increasing at rates of 0.1 ft/hr and 2°/hr, respectively. Use the Chain Rule to find the rate at which the area of the triangle is increasing at the times when the length of each of the equal sides is 20 ft and the included angle is 60°.
The total resistance $R$ of three resistances $R_1$, $R_2$, and $R_3$ connected in parallel is given by 
\[ \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}. \] 
If, at a given instant, $R_1$, $R_2$, and $R_3$ are 100, 200, and 400, and increasing at rates of 1.1, 1.2, and 1.4 ohms/sec, respectively, use the Chain Rule to find the rate at which the total resistance is changing.
The radius $r$ and altitude $h$ of a right circular cylinder are increasing at rates of 0.01 in/min and 0.02 in/min respectively. Use the Chain Rule to find the rate at which the total surface area is increasing at the time when $r = 4$ and $h = 7$ in.
The two shortest sides of a right triangle are measured as 3 cm and 4 cm respectively, and each is increasing at a rate of 0.02 cm/sec. Use the Chain Rule to find the rate at which the length of the hypotenuse is increasing.