MATH 233 PRACTICE MT#1, VERSION #2

DISCLAIMER: This practice exam is intended to give you an *idea* about what a two-hour midterm is like. It is not possible for any one exam to cover every topic, and the *content, coverage and format of your actual exam could be different from this practice exam.*

You can leave answers in terms of fractions and square roots.
To earn full credit you must show your work.

#1. Consider the points $A = (3,1,1), B = (4,1,2), C = (4,4,1)$ in $\mathbf{R}^3$.

(a) Find an equation for the plane containing A, B and C.

(b) A, B and C are three of the four vertices of a parallelogram, while AB and BC are two of its four edges. Find the fourth vertex D of the parallelogram.

#2. Find the parametric equations for the line L_1 of intersection of the planes $x - 2y + z = 6$ and $x + y - z = 0$.

#3. Consider the points $A = (1,1,1), B = (3,3,2)$ and $C = (3,5,16)$. Denote by $\vec{v}$ the vector projection of $\vec{AC}$ onto $\vec{AB}$.

Is the vector $\vec{AC} - \vec{v}$ orthogonal to $\vec{AB}$? Justify your answer.

#4. Write down the parametric equations of the line L containing the point $A = (1,2,3)$ and orthogonal (perpendicular) to the plane P defined by $x - 2y + z = 6$.

#5. The radius of a right circular cone is increasing at a rate of 1.8in/sec while its height is decreasing at a rate of 2.5in/sec. At what rate is the volume of the cone changing when the radius is 120 inches and the height is 140 inches?

#6. The length and width of a rectangle are measured as 30cm and 24cm, respectively, with an error in measurement of at most 0.1cm and 0.2cm, respectively. Estimate the maximum error in the calculated area of the rectangle.

#7. Find the minimal possible directional derivative of $f(x,y) = \ln(x^2 + y^2)$ at the point $P = (1,0)$ and the unit vector in the direction in which it occurs.

#8. Find the dimensions of the rectangular box with largest volume such that the sum of the lengths of its 12 edges is a constant C.
