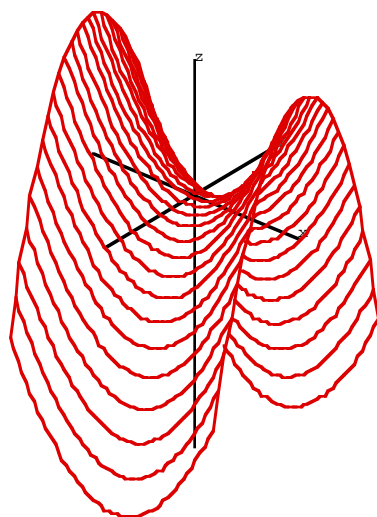


Math 220 Exam 1 Review Worksheet

Suggestion: After reviewing old homework, quizzes and worksheets on your own, work on this sample exam in your study groups, without books or notes, as if you were doing the problems during the weekly discussion period. *Note:* All the following are actual Exam 1 questions from the past several years.

- (7.5 minutes) Let $\mathbf{x} = 2\mathbf{i} + \mathbf{j} - 2\mathbf{k}$ and $\mathbf{y} = \mathbf{i} - 2\mathbf{j} + 2\mathbf{k}$. Find the:
 - component of \mathbf{x} in the direction of \mathbf{y} , that is, the projection of \mathbf{x} onto \mathbf{y}
 - angle between \mathbf{x} and \mathbf{y} .
 - area of the parallelogram determined by \mathbf{x} and \mathbf{y} .
- (10 minutes) A particle moves on the curve $\mathbf{x}(t) = t \sin t \mathbf{i} + t \cos t \mathbf{j} + \pi \ln t \mathbf{k}$. Find:
 - the velocity, speed, acceleration, and unit tangent vector at $t = \pi$
 - a vector equation for the tangent line to the curve at the point where $t = \pi$
 - the tangential component \mathbf{a}_T of acceleration, the normal component \mathbf{a}_N of acceleration and the curvature K at $t = \pi$.
- (5 minutes) The curve $x^2/4 + y^2/9 = 1$ in the xy -plane is revolved about the y axis.
 - What is the equation of the resulting surface, and what is it called?
 - Draw a *rough* sketch of the surface.
- (2.5 minutes) Below is a computer-generated plot of a surface in \mathbf{R}^3 . Give its name, and the general form of its equation.



- (10 minutes) For the surface S that is the graph of $z = x^3 + 3xy^2 - 10$,
 - find the equation of the tangent plane at the point $(2, -1, 4)$.
 - find a unit normal vector at the point $(2, -1, 4)$.
 - use (a) to estimate the value of z if $P(1.98, -0.99, z)$ lies on S .
- (10 minutes) Let $f(x, y, z) = x^2yz + e^x \cos yz$.
 - Find the partial derivatives of f with respect to x and y at the point $(0, 1, \pi/4)$.
 - What is the tangent plane to the graph of f at that point?