

MATH 265
FALL 2008
EXAM 1

1. (5 pt) Let ABCD be a quadrilateral. Show that the quadrilateral formed by connecting the successive midpoints of ABCD is a parallelogram.
2. (5 pt) Find the point of maximum curvature of the function $f(x) = e^{ax}$. What happens as $a \rightarrow \infty$?
3. (5 pt) Find the line of intersection of the planes $4x + 3y + z = 5$ and $x - y - z = 3$.
4. (5 pt) Show that the distance from the point (x_1, y_1) to the line $ax + by + c = 0$ is given by

$$d = \frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$$

where a, b are not both zero.

5. (5 pt) Reparameterize the vector function $\mathbf{r}(t) = \langle a \cos(t), bt, a \sin(t) \rangle$ with respect to arclength.
6. (5 pt) Find the volume of the parallelepiped determined by the vectors $\langle 1, 0, 1 \rangle$, $\langle 3, 1, 2 \rangle$, and $\langle 4, 1, 3 \rangle$.
7. (5 pt) Consider the elliptical coordinates defined by $x = a\rho \sin(\phi) \cos(\theta)$, $y = b\rho \sin(\phi) \sin(\theta)$, and $z = c\rho \cos(\phi)$ where a, b , and c are positive constants. Find the equation for the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = R^2$ in this coordinate system.