Freshman-Sophomore Contest 2004
Sophomore Version, page 1

(There are problems on both the front and back of this sheet. The problems on the front are common to the freshman and sophomore versions of this contest.)

1. Graph \( y = \sin x \sin 2x \) on \([0, 2\pi]\) and find the maximum value of \( \sin x \sin 2x \).

2. Determine, with proof, whether or not the following sum converges:
\[
\sum_{n=1}^{\infty} \frac{\sin(n\pi/4)}{n}
\]

3. A laser pointer is mounted on the rim of a ferris wheel, so that it throws a beam out parallel to the rim of the wheel and in the plane of the wheel. The wheel has a radius of ten meters and is mounted with its axle 11 meters off the ground. It is spinning at a rate of 1 revolution per minute.

The laser beam lights up a spot on the ground. How fast, in meters per second, is the highlighted spot on the ground moving, when the laser is 17 meters up?