

# LS 499 Building 3D Models for the Web

## Rotations Handout     Drs. Alarcón and Donley

We will use the following notation.  $\theta$  denotes the angle theta measured in radians and  $\theta^\circ$  denotes the angle theta measured in degrees.

### Converting angles from degrees to radians.

To convert from degrees to radians use the formula

$$\theta = \frac{\theta^\circ}{180^\circ} \pi$$

and you can approximate  $\pi$  with the value 3.1416

### Converting angles from radians to degrees.

To convert from radians to degrees use the formula

$$\theta^\circ = \frac{\theta}{\pi} 180^\circ$$

and you can approximate  $\pi$  with the value 3.1416

### Finding direction of rotations and angle of rotations

If we start with a direction given by the vector  $d_{\text{start}} = (x, y, z)$  and end with the direction  $d_{\text{end}} = (a, b, c)$  then the direction perpendicular to the plane of rotation (i.e. the direction used in VRML) for the rotation transformation is given by

$$d = (cy - bz, az - cx, bx - ay)$$

and the angle of rotation  $\theta$  is given by

$$\theta = \cos^{-1} \left( \frac{+bx + cy}{\sqrt{x^2 + y^2 + z^2} \cdot \sqrt{a^2 + b^2 + c^2}} \right)$$