Exercise 1

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1. A function of two variables, each of which takes a value in the interval [0,1], that returns a vector that describes a point on a cylinder (but not on the cylinder's circular end caps).

$$\vec{u} = \begin{bmatrix} \sin\theta & \cos\theta & z \end{bmatrix}$$

2. A function of two variables, each of which takes a value in the interval [0,1], that returns a vector that describes a point on a cone (but not on the cone's circular base).

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3. A function of two variables, each of which takes a value in the interval [0,1], that returns a vector that describes a point on a sphere.

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4. A mathematical expression that describes the brightness of a small patch of a surface. The expression should contain terms that model ambient lighting, diffuse reflection, and specular reflection. It should show the role of a vector that is perpendicular to the surface, a vector that points to the source of light, and a vector that points to the eye of the viewer in the calculation of these several components of the surface's illumination.

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5. A mathematical expression that describes a point on a cubic Bezier curve as a product of vector(s) and matrice(s).

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6. A matrix that describes a perspective transformation.

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7. An image from a program that you write. This program will produce an image of one of the American manned spacecraft of the 1960s and 1970s. Begin by modelling a vehicle with cylinders and cones, then elaborate. Add more details to the vehicle, a background that might include planets and stars, or add animation.

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8. An excerpt from your program that shows us some key feature of the program. This might be a loop, the definition of a function, a call to a function, an assignment state that contains on its right hand side a key expression, or something else.
