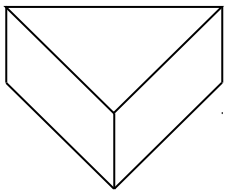
1. This object has triangular top and bottom faces and 3 rectangular side faces, which are perpendicular to the top and bottom faces.



(a) How many nodes in its aspect graph? Show your reasoning.

(b) Sketch any path traversing the aspect graph starting from the node (aspect) where you can only see the top face, and ending at a node where you can see the bottom face and two side faces. Show only the nodes that are in your path. For each node in the path, sketch the aspect that corresponds to that node.

2. You are in car driving in the x-direction, you point your camera out the window in the z-direction and take a picture of a stationary object. The image brightness turns out to be

$$E_1(x,y) = \cos^2 x$$

that is, brightness does not vary in the y-direction, and varies with x as cosine squared. Then one second later you take another image, and find that at the point $x=\pi/4$ mm, $y=1$ mm the image has brightness $E(\pi/4,1)=1/4$.

(a) Find the normal component of optical flow at the point $x=\pi/4$ mm, $y=1$ mm.

(b) In this case, the normal component and the total optical flow are the same. Explain why.

3. Consider a 3-D cylinder aligned vertically (long axis is the y-axis). The light illuminating it is directed in the +z direction, which is also the optical axis of our camera. Three points p_1, p_2, p_3 are $p_1=(0,3)$, $p_2=(0,5)$ and $p_3=(-1/2,4)$.

(a) Suppose we measure the brightness at p1 in the image to be 128. What is the brightness at p2 and p3?

(b) Describe how you could use vertical strips to compute shape from shading for this object.