

7 Further Graphics (pb355)

(a) List at least five different visual cues which our brains use to infer depth. Give a one-sentence explanation of each. [5 marks]

(b) Consider the following signed distance field function:

```
#define min3(a, b, c) min(a, min(b, c))
#define max3(a, b, c) max(a, max(b, c))

float getSdf(vec3 p) {
    vec3 q = vec3(abs(p.x), abs(p.y), abs(p.z));
    return min3(
        max3(q.x / 3.0, q.y, q.z),
        max3(q.x, q.y / 3.0, q.z),
        max3(q.x, q.y, q.z / 3.0)) - 1.0;
}
```

(i) Draw the surface, including its dimensions [4 marks]

(ii) What is the Gaussian curvature of this surface at (3, 0, 0)? [1 mark]

(iii) What is the Gaussian curvature of this surface at (1, 1, 1)? [1 mark]

(iv) What is the total angle deficit of this surface? [2 marks]

(v) What is the angle deficit of this surface at (1, 1, 1)? [2 marks]

(vi) What is the normal of this surface at (1, 1, 1)? [2 marks]

(vii) By inserting a single line of code, how would you modify `getSdf()` so that the figure is repeated infinitely along the X axis, with each repetition exactly touching the previous instance? [3 marks]