CPSC 453 – Self-test – Oct 7-8, 2019

1) Who developed the first interactive graphics system:
   Ivan Sutherland at MIT?
   Alvy Ray Smith At the University of Utah?
   Marceli Wein and Nestor Burtynk at the NRC?

2) What is the value of $\sin \left( \frac{\pi}{4} \right)$?

3) What does it mean that vector multiplication is distributive over addition?

4) Does the equality $\vec{a}(\vec{b} \cdot \vec{c}) = (\vec{a} \cdot \vec{b})\vec{c}$ hold for any vectors $\vec{a}, \vec{b}, \vec{c}$? Some vectors? Never? Justify your answer.

5) Consider vectors defined as follows:

```cpp
struct V3f
{
    float x, y, z;
    V3f(float x1, float y1, float z1)
    { x=x1; y=y1; z = z1 } 
    V3f()
    { x=0; y=0; z=0 }
};
```

Define the overloaded operator `^` for computing the cross product of two vectors in C++.
6) Write the transformation matrix for rotating by angle $\alpha$ around the $x$ axis in 3D.

7) Point $P$ has homogeneous coordinates $[4 \ 2 \ 1 \ 0.5]^T$. What are its $x, y, z$ coordinates in 3D?

7) Which of the following operation(s) cannot be performed as matrix multiplication unless homogeneous coordinates are used:
   - Translation
   - Scaling with respect to the origin of the coordinate system
   - Parallel projection
   - Perspective projection
   - Rotation with respect to the origin of the coordinate system

8) What is Rodrigues’s formula for?

9) What is the “canonical view volume”?

10) Oblique projections are a special case of:
   - Orthographic projections
   - Parallel projections
   - One-point perspective
   - Two-point perspective
   - Three-point perspective