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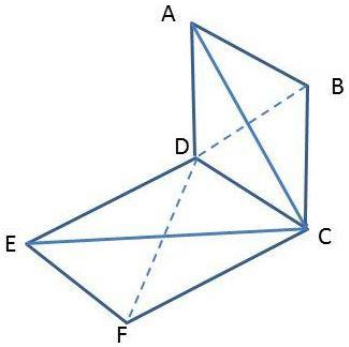
Pop Quiz (Week 2) [10 mins] – 10 pts

1. [1+2+1=4] Consider the object on the right consisting of the solid lines.

a) Write the vertex list of this object.

A, B, C, D, E, F



b) Write the connectivity information of this object.

(ABC), (ADC), (CDE), (CEF)

c) If the bold diagonals are changed to the dotted lines, which of the following properties of the object will change? Mark all that apply.

(i) Geometry **(ii) Topology**

2. Consider a line connecting two points $(1, 1)$ and $(10, 4)$.

a) Write the parametric equation of the line (denote the parameter with the letter t).

There are two possible equations, both of which are correct.

$$(1-t)P_0 + tP_1 = \begin{bmatrix}1\\1\end{bmatrix}(1-t) + \begin{bmatrix}10\\4\end{bmatrix}t = \begin{bmatrix}9t+1\\3t+1\end{bmatrix}$$

$$tP_0 + (1-t)P_1 = \begin{bmatrix}1\\1\end{bmatrix}t + \begin{bmatrix}10\\4\end{bmatrix}(1-t) = \begin{bmatrix}10-9t\\4-3t\end{bmatrix}$$

b) What is the point on the line at $t = \frac{1}{3}$?

If using the first equation: $\begin{bmatrix}9t+1\\3t+1\end{bmatrix} = \begin{bmatrix}9\left(\frac{1}{3}\right)+1\\3\left(\frac{1}{3}\right)+1\end{bmatrix} = \begin{bmatrix}4\\2\end{bmatrix}$

If using the second equation: $\begin{bmatrix}10-9t\\4-3t\end{bmatrix} = \begin{bmatrix}10-9\left(\frac{1}{3}\right)\\4-3\left(\frac{1}{3}\right)\end{bmatrix} = \begin{bmatrix}7\\3\end{bmatrix}$

3. [2+1=3] Consider the scaling transformation $S(s_x, s_y, s_z)$.

a) Write the scaling matrix given by $S(2, 4, 2)$.

$$\begin{bmatrix}2&0&0\\0&4&0\\0&0&2\end{bmatrix}$$

b) S^{-1} is given by which of the following? Mark all that apply.

(i) $S(-2, -4, -2)$

(ii) $S\left(\frac{1}{2}, \frac{1}{4}, \frac{1}{2}\right)$

(iii) $S(-\frac{1}{2}, -\frac{1}{4}, -\frac{1}{2})$