**Fylgiblað með lokaprófi í Tölvugrafík**
**Formúlur:**

$$sx = Ax + C \qquad sy = By + D$$

$$A = \frac{V.r - V.l}{W.r - W.l} \quad C = V.l - AW.l \qquad B = \frac{V.t - V.b}{W.t - W.b} \quad D = V.b - BW.b$$

$$a \circ b = b \circ a, \quad (a + c) \circ b = a \circ b + c \circ b, \quad (sa) \circ b = s(a \circ b), \quad |b|^2 = b \circ b$$

$$b \circ c = |b||c| \cos\theta \Leftrightarrow \cos\theta = \hat{b} \circ \hat{c}$$

$$c = Kv + Mv^{\perp}, \qquad K = \frac{c \circ v}{|v|^2}, \qquad M = \frac{c \circ v^{\perp}}{|v|^2}$$

$$r = a - 2(a \circ \hat{n})\hat{n}$$

$$i = (1, 0, 0), \quad j = (0, 1, 0), \quad k = (0, 0, 1)$$

$$a \times b = (a_Y b_Z - a_Z b_Y)i + (a_Z b_X - a_X b_Z)j + (a_X b_Y - a_Y b_X)k$$

$$i \times j = k, \quad j \times k = i, \quad k \times i = j$$

$$a \times b = -b \times a, \quad a \times (b + c) = a \times b + a \times c, \quad (sa) \times b = s(a \times b)$$

PNF: $n \circ (R - C) = 0, \quad n_X x + n_Y y + n_Z z = n \circ (C - (0,0,0))$

$$t_{hit} = \frac{n \circ (B - A)}{n \circ c}$$

$$\begin{pmatrix} c & -s & 0 \\ s & c & 0 \\ 0 & 0 & 1 \end{pmatrix}, \quad \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & c & -s & 0 \\ 0 & s & c & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}, \quad \begin{pmatrix} c & 0 & s & 0 \\ 0 & 1 & 0 & 0 \\ -s & 0 & c & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}, \quad \begin{pmatrix} c & -s & 0 & 0 \\ s & c & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$u \times v = n, \quad v \times n = u, \quad n \times u = v$$

$$(x^*, y^*, z^*) = \left( N\frac{P_X}{-P_Z}, N\frac{P_Y}{-P_Z}, \frac{aP_Z + b}{-P_Z} \right), \quad top = N \tan\left( \frac{angle}{2} \right)$$

$$R = \begin{pmatrix} \frac{2N}{right - left} & 0 & \frac{right + left}{right - left} & 0 \\ 0 & \frac{2N}{top - bott} & \frac{top + bott}{top - bott} & 0 \\ 0 & 0 & \frac{-(F + N)}{F - N} & \frac{-2FN}{F - N} \\ 0 & 0 & -1 & 0 \end{pmatrix}$$

$$I = I_a \rho_a + I_d \rho_d \cdot lambert + I_s \rho_s \cdot phong^f$$

$$lambert = \max\left( 0, \frac{s \circ m}{|s||m|} \right), \quad phong = \max\left( 0, \frac{h \circ m}{|h||m|} \right)$$