$$\begin{aligned}
\gamma^5\sigma^{\mu\nu} &= \frac{i}{2}\epsilon^{\mu\nu\sigma\rho}\sigma_{\sigma\rho} \\
\not{a}\,\not{b} &= a\cdot b - i\sigma_{\mu\nu}a^\mu b^\nu \\
\gamma^\mu\gamma_\mu &= 4 \\
\gamma^\mu\gamma^\nu\gamma_\mu &= -2\gamma^\nu \\
\gamma^\mu\gamma^\nu\gamma^\lambda\gamma_\mu &= 4g^{\nu\lambda} \\
\gamma^\mu\gamma^\nu\gamma^\lambda\gamma^\sigma\gamma_\mu &= -2\gamma^\sigma\gamma^\lambda\gamma^\nu \\
\gamma^\mu\gamma^\nu\gamma^\lambda\gamma^\sigma\gamma^\rho\gamma_\mu &= 2(\gamma^\rho\gamma^\nu\gamma^\lambda\gamma^\sigma + \gamma^\sigma\gamma^\lambda\gamma^\nu\gamma^\rho) \\
\gamma^\mu\sigma^{\nu\lambda}\gamma_\mu &= 0 \\
\gamma^\mu\sigma^{\nu\lambda}\gamma^\sigma\gamma_\mu &= 2\gamma^\sigma\sigma^{\nu\lambda}
\end{aligned} \tag{A.44}$$

They also obey the following trace identities:

$$\begin{aligned}
\mathrm{Tr}\,(\gamma^{\mu_1}\cdots\gamma^{\mu_n}) &= 0; \quad n \text{ odd} \\
\mathrm{Tr}\,(\gamma^\mu\gamma^\nu) &= 4g^{\mu\nu} \\
\mathrm{Tr}\,(\gamma^\mu\gamma^\nu\gamma^\rho\gamma^\sigma) &= 4(g^{\mu\nu}g^{\rho\sigma} - g^{\mu\rho}g^{\nu\sigma} + g^{\mu\sigma}g^{\nu\rho}) \\
\mathrm{Tr}\,(\gamma^5\gamma^\mu\gamma^\nu\gamma^\rho\gamma^\sigma) &= -4i\epsilon^{\mu\nu\rho\sigma} \\
\mathrm{Tr}\,(\not{a}_1\,\not{a}_2\cdots\not{a}_{2n}) &= a_1\cdot a_2\,\mathrm{Tr}\,(\not{a}_3\cdots\not{a}_{2n}) - a_1\cdot a_3\,\mathrm{Tr}\,(\not{a}_2\,\not{a}_4\cdots\not{a}_{2n}) \\
&+ \cdots + a_1\cdots a_{2n}\,\mathrm{Tr}\,(\not{a}_2\cdots\not{a}_{2n-1})
\end{aligned} \tag{A.45}$$

Under Hermitian conjugation and charge conjugation, the Dirac matrices obey:

$$\begin{aligned}
\gamma^{0\dagger} &= \gamma^0; \quad \gamma^{i\dagger} = -\gamma^i \\
\gamma^0\gamma^\mu\gamma^0 &= \gamma^{\mu\dagger} \\
\gamma^0\gamma_5\gamma^0 &= -\gamma_5^\dagger = -\gamma_5 \\
\gamma^0\gamma_5\gamma^\mu\gamma^0 &= (\gamma_5\gamma^\mu)^\dagger \\
\gamma^0\sigma^{\mu\nu}\gamma^0 &= (\sigma^{\mu\nu})^\dagger \\
C^T &= C^\dagger = -C; \quad C^2 = 1; \quad CC^\dagger = C^\dagger = 1; \\
C\gamma_\mu C^{-1} &= -\gamma_\mu^T
\end{aligned}$$

$$\begin{aligned}
C\gamma_5 C^{-1} &= \gamma_5^T \\
C\sigma_{\mu\nu}C^{-1} &= -\sigma_{\mu\nu}^T \\
C\gamma_5\gamma_\mu C^{-1} &= (\gamma_5\gamma_\mu)^T
\end{aligned} \tag{A.46}$$

Let us now specialize to specific representations. The most common is the *Dirac representation*, which has four complex components:

$$\begin{aligned}
\gamma^0 &= \beta = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}; \quad \gamma^5 = \gamma_5 = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \\
\gamma^i &= \beta\alpha^i = \begin{pmatrix} 0 & \sigma^i \\ -\sigma^i & 0 \end{pmatrix} \\
\sigma^{0i} &= i\alpha^i = i\begin{pmatrix} 0 & \sigma^i \\ \sigma^i & 0 \end{pmatrix}; \quad \sigma^{ij} = \epsilon_{ijk}\begin{pmatrix} \sigma^k & 0 \\ 0 & \sigma^k \end{pmatrix} \\
C &= i\gamma^2\gamma^0 = \begin{pmatrix} 0 & -i\sigma^2 \\ -i\sigma^2 & 0 \end{pmatrix}
\end{aligned} \tag{A.47}$$

Under the Lorentz group, the Dirac representation is reducible. Each Dirac representation can be split up into two smaller representations. We can take the chiral projection, which gives us the *Weyl representation* for left-handed and right-handed spinors:

$$\begin{aligned}
\gamma^0 &= \beta = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}; \quad \gamma^5 = \gamma_5 = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} \\
\gamma^i &= \begin{pmatrix} 0 & \sigma^i \\ -\sigma^i & 0 \end{pmatrix} \\
\sigma^{0i} &= i\begin{pmatrix} \sigma^i & 0 \\ 0 & -\sigma^i \end{pmatrix}; \quad \sigma^{ij} = \epsilon_{ijk}\begin{pmatrix} \sigma^k & 0 \\ 0 & \sigma^k \end{pmatrix} \\
C &= \begin{pmatrix} -i\sigma^2 & 0 \\ 0 & i\sigma^2 \end{pmatrix}
\end{aligned} \tag{A.48}$$