This is the Dirac equation with $c = 1$ and $\hbar = 1$.

$$i\left(\gamma^0\frac{\partial}{\partial t}+\gamma^1\frac{\partial}{\partial x}+\gamma^2\frac{\partial}{\partial y}+\gamma^3\frac{\partial}{\partial z}\right)\psi = m\psi$$

There are lots of ways to choose the gamma matrices. The following gamma matrices are the "Dirac representation."

$$\gamma^0=\begin{pmatrix}1&0&0&0\\0&1&0&0\\0&0&-1&0\\0&0&0&-1\end{pmatrix}\quad \gamma^1=\begin{pmatrix}0&0&0&1\\0&0&1&0\\0&-1&0&0\\-1&0&0&0\end{pmatrix}\quad \gamma^2=\begin{pmatrix}0&0&0&-i\\0&0&i&0\\0&i&0&0\\-i&0&0&0\end{pmatrix}\quad \gamma^3=\begin{pmatrix}0&0&1&0\\0&0&0&-1\\-1&0&0&0\\0&1&0&0\end{pmatrix}$$

The wave function ψ has angular frequency ω equal to the energy of the particle.

$$\omega=\sqrt{k_x^2+k_y^2+k_z^2+m^2}$$

There are four positive frequency solutions that are linearly independent.

$$\psi_1=\begin{pmatrix}\omega+m\\0\\k_z\\k_x+ik_y\end{pmatrix}\exp(ik_xx+ik_yy+ik_zz-i\omega t)\quad \psi_2=\begin{pmatrix}0\\\omega+m\\k_x-ik_y\\-k_z\end{pmatrix}\exp(ik_xx+ik_yy+ik_zz-i\omega t)$$

$$\psi_3=\begin{pmatrix}k_z\\k_x+ik_y\\\omega-m\\0\end{pmatrix}\exp(ik_xx+ik_yy+ik_zz-i\omega t)\quad \psi_4=\begin{pmatrix}k_x-ik_y\\-k_z\\0\\\omega-m\end{pmatrix}\exp(ik_xx+ik_yy+ik_zz-i\omega t)$$

There are four negative frequency solutions that are linearly independent. The negative frequency solutions flip the sign of m.

$$\psi_5=\begin{pmatrix}\omega-m\\0\\k_z\\k_x+ik_y\end{pmatrix}\exp(-ik_xx-ik_yy-ik_zz+i\omega t)\quad \psi_6=\begin{pmatrix}0\\\omega-m\\k_x-ik_y\\-k_z\end{pmatrix}\exp(-ik_xx-ik_yy-ik_zz+i\omega t)$$

$$\psi_7=\begin{pmatrix}k_z\\k_x+ik_y\\\omega+m\\0\end{pmatrix}\exp(-ik_xx-ik_yy-ik_zz+i\omega t)\quad \psi_8=\begin{pmatrix}k_x-ik_y\\-k_z\\0\\\omega+m\end{pmatrix}\exp(-ik_xx-ik_yy-ik_zz+i\omega t)$$

The following solutions are used by quantum electrodynamics.

ψ_1	Fermion, spin up
ψ_2	Fermion, spin down
ψ_7	Anti-fermion, spin up
ψ_8	Anti-fermion, spin down