Some formulas for your reference:

$$\frac{d}{dx}\left(f(x)\frac{dy}{dx}\right) - g(x)y(x) + \lambda w(x)y(x) = 0$$

Fourier sine/cosine series for $0 \le x \le L$: $f(x) = \sum_{n=1}^{\infty} a_n \sin\frac{n\pi x}{L}$ and $f(x) = b_0 + \sum_{n=1}^{\infty} b_n \cos\frac{n\pi x}{L}$

where $a_n = \frac{2}{L}\int_0^L f(x)\sin\left(\frac{n\pi x}{L}\right)dx$, $b_0 = \frac{1}{L}\int_0^L f(x)\,dx$, $b_n = \frac{2}{L}\int_0^L f(x)\cos\left(\frac{n\pi x}{L}\right)dx$

$$\int_0^1 \sin(n\pi x)\,dx = \frac{1+(-1)^{n+1}}{n\pi} \qquad \int_0^1 x\sin(n\pi x)\,dx = \frac{(-1)^{n+1}}{n\pi}$$

$$\int_0^1 \cos(n\pi x)\,dx = 0 \qquad \int_0^1 x\cos(n\pi x)\,dx = -\frac{1+(-1)^{n+1}}{n^2\pi^2}$$

$$\widetilde{F}(k) = \frac{1}{\sqrt{2\pi}}\int_{-\infty}^{\infty} f(x)\,e^{-ikx}\,dx \qquad f(x) = \frac{1}{\sqrt{2\pi}}\int_{-\infty}^{\infty}\widetilde{F}(k)\,e^{ikx}\,dk \qquad \frac{1}{2\pi}\int_{-\infty}^{\infty} e^{i\omega t}\,dt = \delta(\omega)$$

$$\int_0^{\infty} x^n\,e^{-x}\,dx = n! \qquad \delta(ax) = \frac{1}{|a|}\delta(x) \qquad \delta[g(x)] = \sum_{i=1}^{N}\frac{\delta(x-x_{0i})}{|g'(x_{0i})|}$$

$$\nabla^2\psi = \frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2\frac{\partial\psi}{\partial r}\right) + \frac{1}{r^2\sin\theta}\frac{\partial}{\partial\theta}\left(\sin\theta\frac{\partial\psi}{\partial\theta}\right) + \frac{1}{r^2\sin^2\theta}\frac{\partial^2\psi}{\partial\phi^2}$$

$$\Phi(\mathbf{x}) = \sum_{l=0}^{\infty}\sum_{m=-l}^{l}\left(A_{lm}r^l + \frac{B_{lm}}{r^{l+1}}\right)Y_{lm}(\theta,\phi) \qquad \int_0^{\pi}\sin\theta\,d\theta\int_0^{2\pi}d\phi\,Y_{lm}^*(\theta,\phi)Y_{l'm'}(\theta,\phi) = \delta_{ll'}\delta_{mm'}$$

normalized $Y_{lm}(\theta,\phi)'s$: $Y_{00} = \frac{1}{\sqrt{4\pi}}$, $Y_{10} = \sqrt{\frac{3}{4\pi}}\cos\theta$, $Y_{1\pm1} = -\sqrt{\frac{3}{8\pi}}\sin\theta\,e^{\pm i\phi}$