Assignment-6

1. **Show that J_{n+1} has a root between any two consecutive positive zeros of J_n around $x = 0$.**
2. **Express $J_2(x), J_3(x)$ and $J_4(x)$ in terms of $J_0(x)$ and $J_1(x)$.**
3. **Find the differential equation that is satisfied by the function $f(x) = \sqrt{\pi x}\, J_{\frac{1}{2}}(x),\ x > 0$.**
4. **Find the value of the function $x\left(J_{\frac{1}{2}}(x)\right)^2 + x\left(J_{-\frac{1}{2}}(x)\right)^2$.**
5. **Write $J_{\frac{5}{2}}(x)$ and $J_{-\frac{5}{2}}(x)$ in terms of elementary functions.**
6. **Make use of a recurrence relation in the video to show that $\frac{d}{dx}\left(x J_1(x)\right) = x J_0(x)$.**
7. **Make use of a recurrence relation in the video to show that $\frac{d}{dx}\left(J_0(x)\right) = -J_1(x)$.**
8. **Make use of a recurrence relation in the video to evaluate the integral $\int x^3 J_3(x) dx$ in terms of $J_0,\ J_1,\ J_2$.**