S 105 Nr. 1

a) $f(t) = t^2$; $u = 0$; $J_0(x) = \int_0^x t^2\,dt = \left[\frac{t^3}{3}\right]_0^x = \frac{x^3}{3} - \frac{0^3}{3} = \underline{\frac{x^3}{3}}$

$J_0'(x) = \frac{3}{3}x^2 = x^2 = f(x)$

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b) $f(t) = t^2$; $u = 2$; $J_2(x) = \int_2^x t^2\,dt = \left[\frac{t^3}{3}\right]_2^x = \frac{x^3}{3} - \frac{2^3}{3} = \underline{\underline{\frac{x^3}{3} - \frac{8}{3}}}$

$J_2'(x) = \frac{3}{3}x^2 = x^2 = f(x)$

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c) $f(x) = e^x + 1$; $u = 0$; $J_0(x) = \int_0^x (e^t + 1)\,dt = \left[e^t + t\right]_0^x = e^x + x - \{e^0 + 0\}$

$J_0(x) = \underline{\underline{e^x + x - 1}}$

$J_0'(x) = e^x + 1 = f(x)$

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d) $f(x) = \sin(2x)$; $u = -2$; $J_{-2}(x) = \int_{-2}^x \sin(2t)\,dt = \left[-\cos(2t) \cdot \frac{1}{2}\right]_{-2}^x$

$J_{-2}(x) = -\frac{1}{2}\cos(2x) - \{-\frac{1}{2}\cos(2 \cdot (-2))\}$

$J_{-2}(x) = -\frac{1}{2}\cos(2x) + \frac{1}{2}\cos(-4)$

$J_{-2}'(x) = -\frac{1}{2} \cdot (-\sin(2x)) \cdot 2 = 1 \cdot \sin(2x) = f(x)$