Solution (32.20)**:** We start by taking the recurrence relation

$$\left(1-x^2\right)P_n' = -nxP_n + nP_{n-1}.$$

Using the relation

$$(2n+1)xP_n = (n+1)P_{n+1} + nP_{n-1},$$

we get

$$\left(1-x^2\right)P_n' = (n+1)xP_n - (n+1)P_{n+1}.$$

Differentiating, we then get

$$\left(1-x^2\right)P_n'' - 2xP_n' = (n+1)P_n + (n+1)xP_n' - (n+1)P_{n+1}'$$

We want to evaluate

$$(n+1)P_n + (n+1)xP_n' - (n+1)P_{n+1}' = -n(n+1)P_n.$$

by using the generating function

$$P_n = \frac{1}{n!}\frac{\partial^n}{\partial t^n}\left(\left(1-2xt+t^2\right)^{-1/2}\right)\bigg|_{t=0}$$

Solution (32.21)**:**

Solution (32.23)**:**

Solution (35.4)**:**

Solution (35.5)**:**

Solution (35.7)**:**

Solution (35.8)**:**

Solution (35.10)**:**

Solution (35.11)**:**

Solution (35.12)**:**

Solution (35.16)**:**

Solution (35.17 (c))**:**

Solution (35.21)**:**

Solution (35.25)**:**