Supplementary Exercise 9.48 of IPS7e

Degrees of freedom and P-values for X^2-tests: use Table D of PSLS (Table F of IPS) to determine bounds for P-values. Exact P-values can be determined from the `Graph-Probability Distribution Plot` menu in Minitab (shown below).

(a) $\text{df} = (2-1)\cdot(2-1) = 1$, and $P = P(\chi^2(1) > 1.31) > 0.25$, because the 75% percentile is 1.32; exact value: $P = 0.252$.

(b) $\text{df} = (4-1)\cdot(4-1) = 9$, and $P = P(\chi^2(9) > 17.54) < 0.05$, because the 95% percentile is 16.92; exact value: $P = 0.041$. If we wanted more precise bounds on the P-value from the table, the 97.5%-percentile is 19.02, from which we would conclude: $0.025 < P < 0.05$.

(c) $\text{df} = (2-1)\cdot(8-1) = 7$, and $P = P(\chi^2(7) > 22.10) < 0.0025$, because the 99.75% percentile is 22.04; exact value: $P = 0.0024$.

(d) $\text{df} = (5-1)\cdot(3-1) = 8$, and $P = P(\chi^2(8) > 12.61) > 0.10$, because the 90% percentile is 13.36; exact value: $P = 0.126$. If we wanted more precise bounds on the P-value from the table, the 85%-percentile is 12.03, from which we would conclude: $0.10 < P < 0.15$.