

## Supplementary Exercise 9.48 of IPS7e

Degrees of freedom and  $P$ -values for  $\chi^2$ -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)  $df = (2-1) \cdot (2-1) = 1$ , and  $P = P(\chi^2(1) > 1.31) > 0.25$ , because the 75% percentile is 1.32; exact value:  $P = 0.252$ .
- (b)  $df = (4-1) \cdot (4-1) = 9$ , and  $P = P(\chi^2(9) > 17.54) < 0.05$ , because the 95% percentile is 16.92; exact value:  $P = 0.041$ .
- (c)  $df = (2-1) \cdot (8-1) = 7$ , and  $P = P(\chi^2(7) > 22.10) < 0.0025$ , because the 99.75% percentile is 22.04; exact value:  $P = 0.0024$ .
- (d)  $df = (5-1) \cdot (3-1) = 8$ , and  $P = P(\chi^2(8) > 12.61) > 0.10$ , because the 90% percentile is 13.6; exact value:  $P = 0.126$ .

