8.5-4

(a)

$$\begin{aligned} K(\mu) &= P(\overline{X} \geq 83; \mu) \\ &= P\left(Z \geq \frac{83-\mu}{10/5}\right) = 1 - \Phi\left(\frac{83-\mu}{2}\right) \end{aligned}$$

(b)

$$\alpha = K(80) = 1 - \Phi(1.5) = 0.0668$$

(c)

$$\begin{aligned} &K(80) = \alpha = 0.0668 \\ &K(83) = 1 - \Phi(0) = 0.5000 \\ &K(86) = 1 - \Phi(-1.5) = 0.9332 \end{aligned}$$

(d)

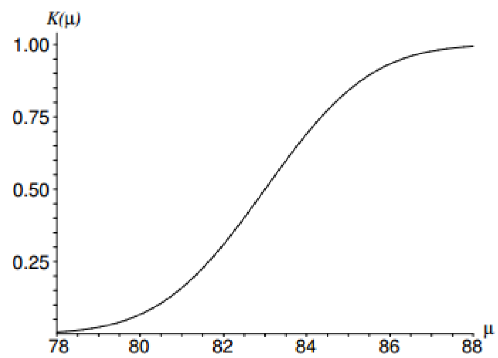

Figure 8.5–4: $K(\mu) = 1 - \Phi([83 - \mu]/2)$

(e)

$$\begin{aligned} p_{\text{ value}} &= P(\overline{X} \geq 83.41; \mu = 80) \\ &= P(Z \geq 1.705) = 0.0441 \end{aligned}$$

8.5-6

(a)

$$\begin{aligned} K(\mu) &= P(\overline{X} \leq 668.94; \mu) = P\left(Z \leq \frac{668.94-\mu}{140/5}; \mu\right) \\ &= \Phi\left(\frac{668.94-\mu}{140/5}\right) \end{aligned}$$

(b)

$$\begin{aligned} \alpha = K(715) &= \Phi\left(\frac{668.94-715}{140/5}\right) \\ &= \Phi(-1.645) = 0.05 \end{aligned}$$

(c)

$$\begin{aligned} &K(668.94) = \Phi(0) = 0.5 \\ &K(622.88) = \Phi(1.645) = 0.95 \end{aligned}$$

(d)

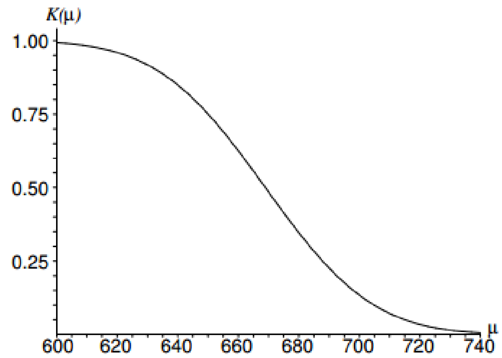

Figure 8.5–6: $K(\mu) = \Phi([668.94 - \mu]/[140/5])$

(e) $\overline{x} = 667.992 < 668.94$, reject H_0

(f)

$$\begin{aligned} p - value &= P(X \leq 667.92; \mu = 715) \\ &= P(Z \leq -1.68) = 0.0465 \end{aligned}$$

8.5-7

$$K(\mu) = \Phi(\frac{c - \mu}{140/\sqrt{n}})$$

$K(715) = 0.05$, $K(650) = 0.9$, n = 40 , c = 678.38

8.5-8

(a)

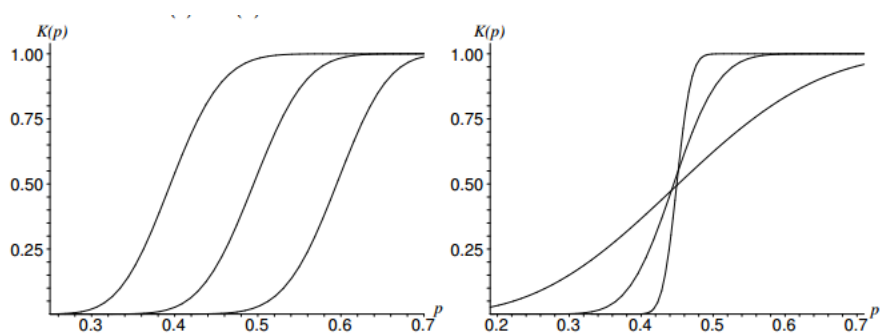

Figure 8.5–8: Power functions corresponding to different critical regions and different sample sizes

(b) $\mu = np$, $\sigma^2 = np(1 - P)$

$$K(\mu) = P(Y \geq c; \mu) = P(\frac{Y - np}{\sqrt{np(1-p)}}; \geq \frac{c - np}{\sqrt{np(1-p)}}; p) = 1 - \Phi(\frac{c - 100p}{\sqrt{100p(1-p)}})$$

8.5-11 $Y = \sum_{i=1}^{n} X_i \sim N(np, np(1-p)$

$$K(\mu) = P(Y \geq c; \mu) = P(\frac{Y - np}{\sqrt{np(1-p)}}; \geq \frac{c - np}{\sqrt{np(1-p)}}; p) = 1 - \Phi(\frac{c - np}{\sqrt{np(1-p)}})$$

$K(1/26) = 0.05$, $K(0.1) = 0.9$, n = 130 , c = 8.6

$$q_9 = 7.6 < \chi^2_{0.05}(9) = 16.919, \text{ do not reject } H_0$$

9.1-4

$$\begin{aligned} q_3 &= \tfrac{(124-117)^2}{117} + \tfrac{(30-39)^2}{39} + \tfrac{(43-39)^2}{39} + \tfrac{(11-13)^2}{13} \\ &= 0.419 + 2.077 + 0.410 + 0.308 = 3.214 < 7.815 = \chi^2_{0.05}(3) \end{aligned}$$

Thus we do not reject the Mendelian theory with these data.

9.1-5 $A_0 = 0$ female children, $A_1 = 1$ female children, A_2 =2 female children, $A_3 = 3$ female children. $X \sim b(3, 0.5)$ $P_{00} = \frac{1}{8}, P_{10} = \frac{3}{8},\ P_{20} = \frac{3}{8},\ P_{30} = \frac{1}{8}$

(a) $q_3 \geq 7.815$

(b) $q_3 = 1.744 < 7.815,$ do not reject H_0

9.1-7 $P(X = x) = \frac{e^{-\lambda}\lambda^x}{x!},\ x = 0, 1, 2, 3, 4$ $y_0 = 92, p_{00} = 0.607$,$y_1 = 9246, p_{00} = 0.303$,$y_2 = 8, p_{00} = 0.076$,$y_3 = 3, p_{00} = 0.013$,$y_4 = 1, p_{00} = 0.002$

$$q_4 = 4.12 < \chi^2_{0.01}(5 - 1) = 13.28$$

Do not reject H_0.

9.2-1

$$3.23 < 11.07, \text{ do not reject } H_0$$

9.2-3

$$2.40 < 5.991, \text{ do not reject } H_0$$

9.1-11 $\overline{x} = 320.10, s^2 = 45.56, K = 10$ equally partitioning $[0, 1]$ i.e $b_i = \frac{i}{10},\ i = 1, \cdots, 9$ $a_i = F_0^{-1}(b_i),\ where\ F_0(b) \sim N(\bar{x}, s^2)$ $q_9 = 7 < \chi^2_{0.05}(10 - 1 - 2) = 14.067$ DO not reject H_0

9.2.2

$$10.18 < 20.48 = \chi^2_{0.025}(10), \text{ accept } H_0$$

9.2-4

In the combined sample of 45 observations, the lower third includes those with scores of 61 or lower, the middle third have scores from 62 through 78, and the higher third are those with scores of 79 and above.

	low	middle	high	Totals
Class U	9 (5)	4 (5)	2 (5)	15
Class V	5 (5)	5 (5)	5 (5)	15
Class W	1 (5)	6 (5)	8 (5)	15
Totals	15	15	15	45

$$q = 3.2 + 0.2 + 1.8 + 0 + 0 + 0 + 3.2 + 0.2 + 1.8 = 10.4$$

$$q = 10.4 > 9.488 = \chi^2_{0.05}(4)$$

we reject the equality of these three distributions.