$$a_0 = \frac{1}{2}\int_{-2}^{2} f(t)\,dt = \frac{1}{2}\left[\int_{-2}^{0} -1\,dt + \int_{0}^{2} 1\,dt\right] = \frac{1}{2}\Big[(-2)+(2)\Big] = 0$$

$$a_n = \frac{1}{2}\int_{-2}^{2} f(t)\cos\frac{n\pi t}{2}\,dt = \frac{1}{2}\left[\int_{-2}^{0} -\cos\frac{n\pi t}{2}\,dt + \int_{0}^{2}\cos\frac{n\pi t}{2}\,dt\right]$$

$$= \frac{1}{2}\left\{\left[-\frac{2}{n\pi}\sin\frac{n\pi t}{2}\right]_{-2}^{0} + \left[\frac{2}{n\pi}\sin\frac{n\pi t}{2}\right]_{0}^{2}\right\}$$

$$= \frac{1}{2}\left\{\left(\frac{-2}{n\pi}\right)\big(\sin 0 - \sin(-n\pi)\big) + \left(\frac{2}{n\pi}\right)\big(\sin n\pi - \sin 0\big)\right\}$$

$$= 0$$

$$b_n = \frac{1}{2}\int_{-2}^{2} f(t)\sin\frac{n\pi t}{2}\,dt = \frac{1}{2}\left\{\int_{-2}^{0} -\sin\frac{n\pi t}{2}\,dt + \int_{0}^{2}\sin\frac{n\pi t}{2}\,dt\right\}$$

$$= \frac{1}{2}\left\{\left[\frac{2}{n\pi}\cos\frac{n\pi t}{2}\right]_{-2}^{0} + \left[-\frac{2}{n\pi}\cos\frac{n\pi t}{2}\right]_{0}^{2}\right\}$$

$$= \frac{1}{2}\cdot\frac{2}{n\pi}\left\{\cos 0 - \cos(-n\pi) - \cos(n\pi) + \cos 0\right\}$$

$$= \frac{1}{2}\,\frac{2}{n\pi}\left\{2\cos 0 - 2\cos(n\pi)\right\}$$

$$= \frac{2}{n\pi}\left(1 - \cos n\pi\right) \qquad \cos n\pi = \begin{cases} 1 & n \text{ even} \\ -1 & n \text{ odd}\end{cases}$$

$$= \frac{2}{n\pi}\left(1-(-1)^n\right) = \begin{cases} \frac{4}{n\pi} & n \text{ odd} \\ 0 & n \text{ even}\end{cases} \qquad \cos n\pi = (-1)^n$$