2. 课本 323 页习题 7.16

(1)当$j_0 = 1$时，

$$\varphi_{1,0}(n) = \sqrt{2}\varphi(2n) = [\sqrt{2}, \sqrt{2}, 0, 0]$$
$$\varphi_{1,1}(n) = \sqrt{2}\varphi(2n-1) = [0, 0, \sqrt{2}, \sqrt{2}]$$
$$\psi_{1,0}(n) = \sqrt{2}\Psi(2n) = [\sqrt{2}, -\sqrt{2}, 0, 0]$$
$$\psi_{1,1}(n) = \sqrt{2}\Psi(2n-1) = [0, 0, \sqrt{2}, -\sqrt{2}]$$

$$w_{\varphi}(1,0) = \frac{1}{2}(\sqrt{2}*1 + \sqrt{2}*4 + 0*-3 + 0*0) = \frac{5\sqrt{2}}{2}$$
$$w_{\varphi}(1,1) = \frac{1}{2}(0*1 + 0*4 + \sqrt{2}*-3 + \sqrt{2}*0) = -\frac{3\sqrt{2}}{2}$$
$$w_{\psi}(1,0) = \frac{1}{2}(\sqrt{2}*1 - \sqrt{2}*4 + 0*-3 + 0*0) = -\frac{3\sqrt{2}}{2}$$
$$w_{\psi}(1,1) = \frac{1}{2}(0*1 + 0*4 + \sqrt{2}*-3 - \sqrt{2}*0) = -\frac{3\sqrt{2}}{2}$$

所以，

$$f(x) = \frac{1}{2}[\frac{5\sqrt{2}}{2}\varphi_{1,0}(n) - \frac{3\sqrt{2}}{2}w_{\varphi}(1,1) - \frac{3\sqrt{2}}{2}w_{\psi}(1,0) - \frac{3\sqrt{2}}{2}w_{\psi}(1,1)]$$

(2)

$$f(1) = \frac{1}{2}[\frac{5\sqrt{2}}{2}*\sqrt{2} - \frac{3\sqrt{2}}{2}*0 - \frac{3\sqrt{2}}{2}*(-\sqrt{2}) - \frac{3\sqrt{2}}{2}*0] = 4$$