1. (d)
2. (e)
3. (d)
4. (d)
5. (b)
6. (d) Clearly the expectation values for $\mathbf{e}_1$ and $\mathbf{e}_2$ are 0.5. The expectation value for $\mathbf{e}$ is

$$\begin{aligned}\int_0^1 \int_0^1 dx_1\, dx_2 \min(x_1, x_2) &= \int_0^1 \int_0^{x_1} dx_1\, dx_2\, x_2 + \int_0^1 \int_0^{x_2} dx_2\, dx_1\, x_1 \\ &= \int_0^1 dx_1\, x_1^2 \qquad \text{integrands are same so we double} \\ &= \frac{1}{3}\end{aligned}$$

7. Let's measure the cross-validation for the constant model. If we leave out the point $(-1, 0)$, then the fit is $y = 1/2$ and the squared error is $1/4$. The same goes for leaving out $(1, 0)$. If we leave out $(\rho, 1)$, then our squared error is 1 and the average cross-validation error is

$$\frac{1}{3}\left(1 + \frac{1}{4} + \frac{1}{4}\right) = \frac{1}{2}$$

We do the same thing for the linear case. If we leave out $(-1, 0)$, then the model is

$$y = \frac{1}{1-\rho}(1 - x)$$

which gives a squared error of

$$E_{\text{val}} = \frac{4}{(1-\rho)^2}.$$

If we leave out $(\rho, 1)$, then the model is $y = 0$ and the squared error is 1. If we leave out $(1, 0)$ then the model is

$$y = \frac{1}{1+\rho}(x + 1)$$

and the squared error is

$$E_{\text{val}} = \frac{4}{(1+\rho)^2}$$

so the cross-validation error is

$$\frac{1}{3}\left[1 + \frac{4}{(1-\rho)^2} + \frac{4}{(1+\rho)^2}\right]$$

Thus, setting these cross-validation errors equal yields

$$\frac{4}{(1-\rho)^2} + \frac{4}{(1+\rho)^2} = \frac{1}{2}$$

Simplifying to standard quadratic form gives

$$\rho^4 - 18\rho^2 - 15 = 0$$

which gives the solution

$$\rho = \sqrt{9 + 4\sqrt{6}}.$$

8. (c) 60 percent

9. (d) 62 percent

10. (b) Average of 3.8 support vectors per run.