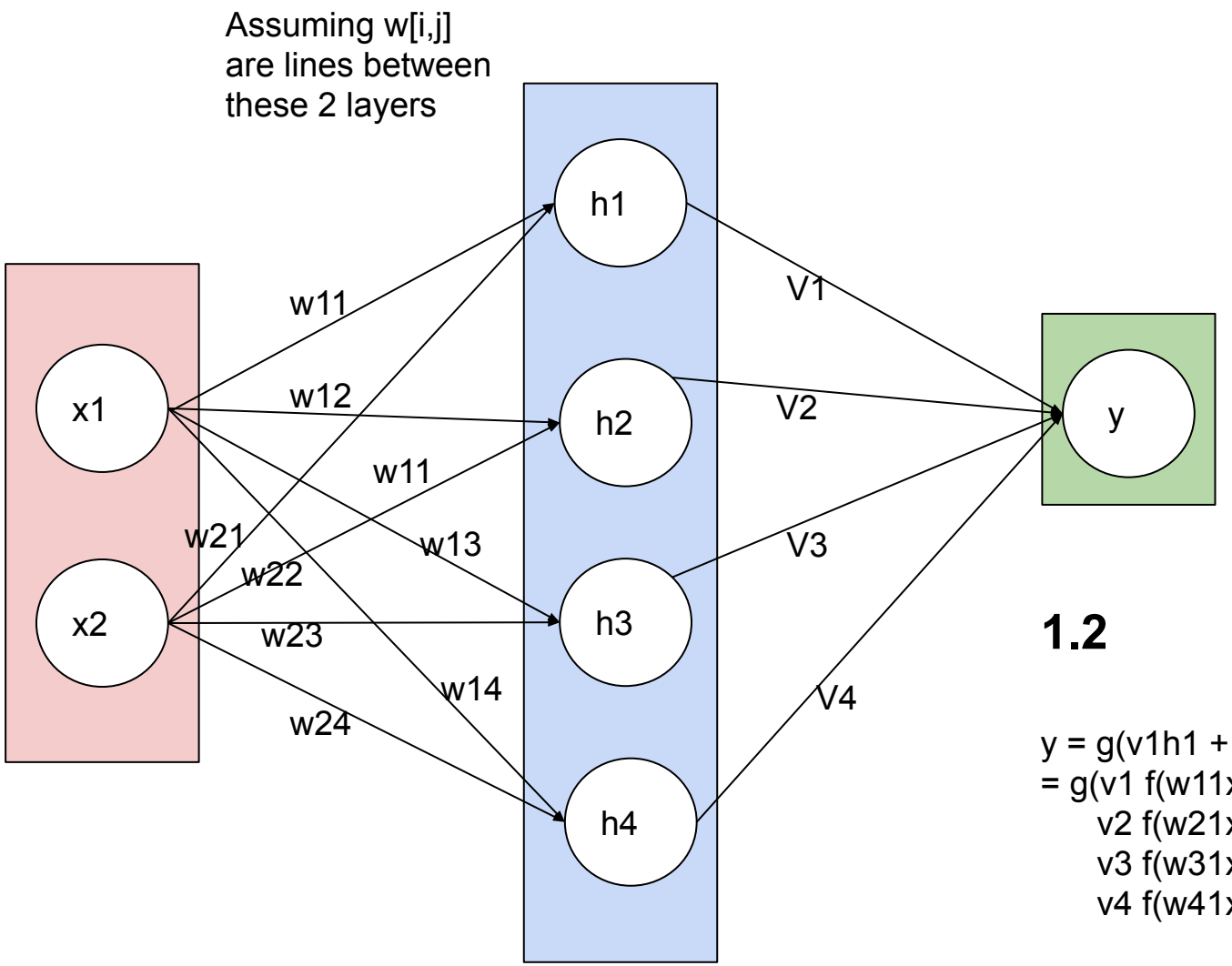
1.1



1.2

y = g(v1h1 + v2h2 + v3h3 + v4h4 + c)
= g(v1 f(w11x1 + w12x2 + b1) +
v2 f(w21x1 + w22x2 + b2) +
v3 f(w31x1 + w32x2 + b3) +
v4 f(w41x1 + w42x2 + b4) + c)

f is rectified linear activation function;
g is the output function and is not specified

Problem 2.1

$$f(x,y) = (3-x^3) + 50 * (2y^2 - x)^2$$
$$= 3 - x^3 + 50 * (4y^4 - 4xy^2 + x^2)$$
$$= 3 - x^3 + 200y^4 - 200xy^2 + 50x^2$$

$$\frac{\partial f(x,y)}{\partial x} = -3x^2 - 200y^2 + 100x$$
$$\frac{\partial f(x,y)}{\partial y} = 800y^3 - 400xy$$

Problem 3.1

$$\frac{dL}{d\hat{y}} = -\left(\frac{y_i}{\hat{y}_i} - \frac{1-y_i}{1-\hat{y}_i}\right)$$
$$\frac{\partial L}{\partial v_i} = \frac{\partial L}{d\hat{y}} h_i = -\left(\frac{y_i}{\hat{y}_i} - \frac{1-y_i}{1-\hat{y}_i}\right) h_i \quad (h_i > 0)$$
$$\frac{\partial L}{\partial c} = \frac{\partial L}{\partial \hat{y}} = -\left(\frac{y_i}{\hat{y}_i} - \frac{1-y_i}{1-\hat{y}_i}\right)$$
$$\frac{\partial L}{\partial w_{1i}} = \frac{\partial L}{\partial \hat{y}} v_1 x_1 = -\left(\frac{y_i}{\hat{y}_i} - \frac{1-y_i}{1-\hat{y}_i}\right) v_1 x_1$$
$$\frac{\partial L}{\partial w_{2i}} = \frac{\partial L}{\partial \hat{y}} v_2 x_2 = -\left(\frac{y_i}{\hat{y}_i} - \frac{1-y_i}{1-\hat{y}_i}\right) v_2 x_2$$
$$\frac{\partial L}{\partial b_i} = \frac{\partial L}{\partial \hat{y}} v_2$$