Task 5.2 Gradient of a Bilinear form

1. $n \times m$
2.
    1. $n \times 1$
    2. $1 \times n$
    3. $m \times 1$
    4. $1 \times m$

3.
    1. $\nabla_x f = \frac{\partial f}{\partial x} = \frac{\partial (x^t W y)}{\partial x} = Wy$
    2. $\nabla_{x^t} f = \frac{\partial f}{\partial x^t} = \frac{\partial (x^t W y)}{\partial x^t} = y^t W^t$
    3. $\nabla_y f = \frac{\partial f}{\partial y} = \frac{\partial (x^t W y)}{\partial y} = W^t x$
    4. $\nabla_{y^t} f = \frac{\partial f}{\partial y^t} = \frac{\partial (x^t W y)}{\partial y^t} = x^t W$