**Slide 19:**

1. Select all that are true about derivatives of a scalar function f(X) of multivariate inputs
   1. At any location X, there may be many directions in which we can step, such that f(X) increases
   2. The direction of the gradient is the direction in which the function increases fastest
   3. The gradient is the derivative of f(X) w.r.t. X
2. y = f(x) is a scalar function of an Nx1 column vector variable x.

What is the shape of the derivative of y with respect to x

1. Scalar
2. N x 1 column vector
3. 1 x N row vector
4. There is insufficient information to decide

**Slide 21:**

Which of the following is true (choose only one) about the ***minimum*** of a function f(x)

1. The derivative f’(x) = 0 at the minimum. This is the only condition to be satisfied
2. f’(x) = 0 and the second derivative f”(x) is negative
3. f’(x) = 0 and the second derivative f”(x) is positive

**Slide 28:**

Select all that are true about derivatives of a scalar function f(X) of multivariate inputs

* 1. At any location X, there may be many directions in which we can step, such that f(X) increases
  2. The direction of the gradient is the direction in which the function increases fastest
  3. The gradient is the derivative of f(X) w.r.t. X

**Slide 44:**

y = f(x) is a scalar function of an Nx1 column vector variable x.

Starting from x = x0, in which direction must we move in the space of x, to achieve the maximum decrease in f()?

1. Exactly in the direction of the gradient of f(x) at x0
2. Exactly perpendicular to the direction of the gradient of f(x) at x0
3. Exactly opposite to the direction of the gradient of f(x) at x0
4. Exactly perpendicular to the direction of the gradient of f(x) at x0.

**Slide 82:**

Select all that are correct

1. The gradient of the loss will always be 0 or close to 0 at a minimum
2. The gradient of the loss may be 0 or close to 0 at a minimum
3. The gradient of the loss may have large magnitude at a minimum
4. If the gradient is not 0 at a minimum, it must be a local minimum