ML Task-1

Ans 1) Linear regression shows a linear relationship b/w a dependent variable (y) and one or more independent variable (x). It is used for predictive analysis.

Simple LR	Multiple LR
→ Only one i/p o/p variable.	→ More than 1 i/p column.
→ Simpler	→ Complex
→ One relationship only.	→ Multiple relationship.
→ $Y = C_0 + C_1 X + e$	→ $Y = C_0 + C_1 X_1 + C_2 X_2 + \cdots$

Ans 2) $y = mx + b$.

y → dependent variable
x → independent variable
m → slope
b → intercept

'm' :- According to this, m is weightage which describes on what amount dependent variable depends on independent variable. If value of m is more than dependent variable depends more on independent variable & vice versa.

'b' :- is offset as per this. Sometimes, if value of mx becomes 0 then also value of y will have some value and this is offset.

experience (x)	package (y)
1	8.0
2	10

Now, according to the condition, if experience is 0, then package will also be 0. So in that case people with 0 experience will not have any salary but it is not true. They also get some salary and that is 'b'.

Ans-3). Cost function describes the error b/w predicted and expected values and presents that error in form of single real no.

$$MSE = \frac{1}{2m} \sum_{i=1}^{m} (\hat{y}_i - y_i)^2 .$$

The Mean Squared Error measures how close a regression line is to a set of data points.

$$MSE = \frac{1}{N} \sum_{i=1}^{n} (y_i - (mx_i + b))^2 .$$

Ans-4) Gradient descent is a widely used optimization that minimizes cost func^n. of a model during training. It works by iteratively adjusting the weights or parameters of model in direction of negative gradient of cost function until min^n. of cost fun^n is reached.

Ans-5 It measure model error by guiding optimization algo to find parameter values that minimize error & leading to best fit LR model.

Ans-5). $x[1,2,3,4,5]$ y $[2,4,5,4,5]$

x	y	xy	x^2	
1	2	2	1	$\Sigma x = 15$
2	4	8	4	$\Sigma y = 20$
3	5	15	9	$\Sigma xy = 66$
4	4	16	16	$\Sigma x^2 = 55$
5	5	25	25	

$$m = \frac{n\Sigma xy - \Sigma x \Sigma y}{n\Sigma x^2 - (\Sigma x)^2} = \frac{30}{50} = 0.6$$

$$b = \frac{\Sigma y - m\Sigma x}{n} = 2.2.$$

$$y = mx + b$$
$$y = 0.6x + 2.2.$$

Ans-6) $y = 0.6x + 2.2$

~~$y = x$~~ for $x = 6$,

$y = 0.6 \times 6 + 2.2 = 5.8$

Ans 7) $y = 0.6x + 2.2$

$x = 1$, $y = 0.6 + 2.2 = 2.8$

$x = 2$, $y = 3.4$

$x = 3$, $y = 4$

$x = 4$, $y = 4.6$

$x = 5$, $y = 5.2$.

Actual	Predicted	Error	Sq. Error.
2	2.8	−0.8	0.64
4	3.4	−0.6	0.36
5	4	1	1
4	4.6	−0.6	0.36
5	5.2	−0.2	0.04
		−1.2	2.4

$$MSE = \frac{2.4}{5} = 0.48$$

8) $y = 3x + 7$.

The value of slope $(m) = 3$.

$$m = \frac{n\Sigma xy - \Sigma x \Sigma y}{n\Sigma x^2 - (\Sigma x)^2}$$

The value of intercept $(b) = 7$.

It is obtained by $b = \frac{\Sigma y - m\Sigma x}{n}$.