Started on	Monday, 18 October 2021, 11:30 PM
State	Finished
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Grade	**11.00** out of 12.00 (**92**%)

Question **1**

Correct

Mark 1.00 out of 1.00

Suppose we have the following data:

$$(1, 0.14), (2, 0.2), (3, 0.4), (4, 0.4), (5, 0.6)$$

We know this data fits a saturation growth rate model

$$y = a\frac{x}{x+b}$$

Using simple linear regression, find the coefficients

$$a, b$$

Select one:

a.
$$a = 1.56$$
$$b = 11.4$$

b.
$$a = 1.45$$
$$b = 10.12$$

c. ✔
$$a = 1.48$$
$$b = 10.01$$

d.
$$a = 1.5$$
$$b = 9.88$$

The correct answer is:

$a = 1.48$

$b = 10.01$

Question **2**

Correct

Mark 1.00 out of 1.00

Using the general model for linear regression, what are the *z* functions for polynomial regression?

Select one:

a. $$ z_0 =0, z_1 = 1, z_2 = 2, ..., z_m = m$$

b. $$ z_0 =1, z_1 = x, z_2 = z_3 =...=z_m =0$$

c. $$ z_0 = 1, z_1 = x, z_2 = x^2,...,z_m=x^m$$ ✔

d. $$ z_0 =1, z_1= x_1, z_2 = x_2, ..., z_m=x_m$$

The correct answer is: $$ z_0 = 1, z_1 = x, z_2 = x^2,...,z_m=x^m$$

Question **3**

Correct

Mark 1.00 out of 1.00

Which of the following is a matrix equation we can use to find the coefficients in linear regression?

Select one:

a. $$ A = (Z^TZ)^{-1}Z^TY $$ ✔

b. $$ A = (Z^TZ)^{-1}ZY $$

c. $$ A = (Z^TZ)Z^TY $$

d. $$ A = (Z^T)^{-1}Z^TY $$

The correct answer is: $$ A = (Z^TZ)^{-1}Z^TY $$

Question **4**

Correct

Mark 1.00 out of 1.00

Using the general model for linear regression, what are the *z* functions for simple linear regression?

Select one:

a. $$ z_0 =0, z_1 = 1, z_2 = 2, ..., z_m = m$$

b. $$ z_0 =1, z_1 = x, z_2 = z_3 =...=z_m =0$$ ✔

c. $$ z_0 = 1, z_1 = x, z_2 = x^2,...,z_m=x^m$$

d. $$ z_0 =1, z_1= x_1, z_2 = x_2, ...,z_m=x_m$$

The correct answer is: $$ z_0 =1, z_1 = x, z_2 = z_3 =...=z_m =0$$

Question **5**

Correct

Mark 1.00 out of 1.00

What transformation would you use to linearize the power equation $$ y = ax^{b} \text{?}$$

Select one:

- a. Find Taylor's series.
- b. Use the Laplace transform.
- c. Take the inverse of both sides (e.g. 1/y)
- d. Take logs of both sides ✔

The correct answer is: Take logs of both sides

Question **6**

Correct

Mark 1.00 out of 1.00

What transformation would you use to linearize the exponential equation $$ y = ae^{bx} ?$$

Select one:

- a. Find Taylor's series.
- b. Take the inverse of both sides (e.g. 1/y)
- c. Take natural logs of both sides ✔
- d. Use the Laplace transform.

The correct answer is: Take natural logs of both sides

Question **7**

Correct

Mark 1.00 out of 1.00

If $$ y = a_0 + a_1x + a_2x^2 $$ is the equation of the best fit quadratic, what is the formula for the sum of squares of the residuals if we have a dataset with *n* data points?

Select one:

- a. $$ \sum _{i=1}^n (y_i-a_0-a_1x_i)^2 $$
- b. $$ \sum _{i=1}^n (y_i-a_0-a_1x_i-a_2x_i^2)^2 $$ ✔
- c. $$ \sum _{i=1}^{n^2} (y_i-a_0-a_1x_i-a_2x_i^2)^2 $$
- d. $$ \sum _{i=1}^n (y_i-a_0-a_1x_i-a_2x_i^2) $$

The correct answer is: $$ \sum _{i=1}^n (y_i-a_0-a_1x_i-a_2x_i^2)^2 $$

Question **8**

Correct

Mark 1.00 out of 1.00

What transformation would you use to linearize the saturation growth rate equation $$ y = a\frac{x}{x+b} \text{?}$$

Select one:

- a. Take logs of both sides
- b. Find Taylor's series.
- c. Take the inverse of both sides (e.g. 1/y) ✔
- d. Use the Laplace transform.

The correct answer is: Take the inverse of both sides (e.g. 1/y)

Question **9**

Correct

Mark 1.00 out of 1.00

Suppose we have the following data: $$ (1,2.5), (2,4), (3,7), (4,11), (5,18)$$

We know this fits an exponential model $$ y = ae^{bx} $$
Using simple linear regression, find the coefficients $$ a, b $$

Select one:

- a. $$a =1.55 $$ $$ b = 0.47 $$
- b. $$a =1.52 $$ $$ b = 0.5 $$ ✔
- c. $$a =1.46 $$ $$ b = 0.51 $$
- d. $$a =1.51 $$ $$ b = 0.49 $$

The correct answer is: $$a =1.52 $$ $$ b = 0.5 $$

Question **10**

Correct

Mark 1.00 out of 1.00

Using the general model for linear regression, what are the *z* functions for multiple linear regression?

Select one:

- a. $$ z_0 =1, z_1 = x, z_2 = z_3 =...=z_m =0$$
- b. $$ z_0 = 1, z_1 = x , z_2 = x^2,..., z_m=x^m$$
- c. $$ z_0 =1, z_1= x_1, z_2 = x_2, ..., z_m=x_m$$ ✔
- d. $$ z_0 =0, z_1 = 1, z_2 = 2, ..., z_m = m$$

The correct answer is: $$ z_0 =1, z_1= x_1, z_2 = x_2, ..., z_m=x_m$$

Question **11**

Incorrect

Mark 0.00 out of 1.00

If we perform multiple simple linear regression on data where the *y* variable depends on two independent *x* variables, what kind of mathematical object are we creating to model the relationship?

Select one:

- a. line ✖
- b. plane
- c. circle
- d. sphere

The correct answer is: plane

Question **12**

Correct

Mark 1.00 out of 1.00

Suppose we calculate the best fit polynomial of degree *m* for a dataset with *n* data points. What is the equation of the standard error?

Select one:

- a. $$ \sqrt{\frac{S_r}{n-(m+1)}} $$ ✔
- b. $$ \sqrt{\frac{S_t}{n-(m+1)}} $$
- c. $$ \sqrt{\frac{S_r}{n-2}} $$
- d. $$ \sqrt{\frac{S_r}{n-1}} $$

The correct answer is: $$ \sqrt{\frac{S_r}{n-(m+1)}} $$

◄ Homework 9

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