Maths & Stats Pre-Sessional Tutorial

Topic 4: Simple Functions

Exercise 1

A large company would like to investigate if the level of education, measured in years of education (EDU), is determinant in having a higher salary. Using the company's human resource information, the following model has been estimated:

$$\ln(WAGE) = 1.439 + .0834\ EDU$$

a) Define which variable in the above model is the dependent and which one is the independent variable.
b) Is 0.0834 an estimator or an estimate? Explain your answer.
c) You want to test whether having more years of education expresses the possibility of having a higher salary. Write down the null and the alternative hypotheses.
d) Determine whether years of education has a positive or negative impact on the salary.
e) Is the above model a linear model?
f) Draw the regression line.
g) If years of education does not have any impact on the salary, how the regression line changes. Draw the new line.

Exercise 2

Select the correct answer:

The ratio of the change in y-values to the change in x-values is called:

a) Dependent variable
b) Independent variable
c) Intercept
d) Slope

Exercise 3

Select the correct answer:

A horizontal line has a slope with a value that is:

a) positive
b) undefined
c) negative
d) zero

Exercise 4

Standard form for a linear equation is:

a) y = x
b) y = mx + b
c) Y-Y1 / X-X1
d) Ax + By = C

Exercise 5

Write down the functions and draw the graph of the functions:

a) passing through (0,1) and having slope -2
b) passing through (-2,2) and parallel to: y = 2 — 5x

Exercise 6

Consider the following quadratic function:

i. $f(x) = -x^2 + 8x - 12$
ii. $f(x) = 2x^2 - 11x - 3$
iii. $f(x) = x^2 + 6x + 9$

a) Explain whether the functions are convex or concave.
b) After solving an optimisation problem for equation (ii), we obtain the following point (3, -21). Is this point a maximum or a minimum point of the function.

Exercise 7

Compute simple return and log return for the stock below and complete the table.

Period	Price	Simple Return	Log Return
Year 1	100	-	-
Year 2	200		
Year 3	100		
	Average return:		

Exercise 8

An economy is forecast to grow continuously so that the gross national product (GNP) measured in billions of dollars, after t years is given by:

$$88 = 80e^{0.02t}$$

After how many years is GNP forecast to be $88 billion? What does the model predict about the value of GNP in the long run?

Exercise 9

A model for GDP, g, measured in billions of dollars, over a period of t years can be formulated in the form : $g = Be^{At}$, where A and B are two parameters.

Can this model be estimated using a linear regression model? Explain your answer.

Exercise 10

Compute the present value of £500 to be received in one year's time given the interest rate of 8%.

Exercise 11

Compute the present value of receiving 1 million at the end of each of the next three years given the interest rate of 12%.

Exercise 12

Determine the present value of $25,000 to be received in the future in the following situations. In each case, assume the interest rate is 8%.

a) Payment is received at the end of one year's time given annual compounding.
b) Payment is received at the end of 20 years' time given annual compounding.
c) Payment is received at the end of one year's time given quarterly compounding (i.e., every three months).
d) Payment is received at the end of 20 years' time given quarterly compounding.
e) Payment is received at the end of one year's time given continuous compounding.
f) Payment is received at the end of 20 years' time given continuous compounding.

Check your knowledge:

Test your knowledge with the following multiple-choice questions.

For each question, select the correct answer. Explain your decision.

Question 1

Determine the missing value in this table of values for the function $y = 2^x$.

x	$y = 2^x$
−1	0.5
0	
1	2

a) 1

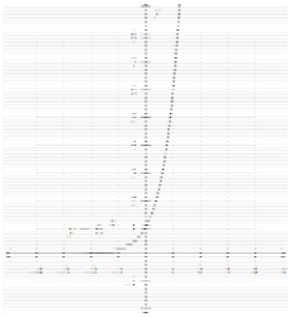
b) -1

c) 0

d) 2

Question 2

Determine the range of $y = 6^x$.



a) x > 0

b) y is in the interval (-∞, ∞)

c) y < 0

d) y > 0

Question 3

Which exponential function is decreasing?

a) $y = \left(\frac{1}{3}\right)^x$

b) $y = 7.7^x$

c) $y = 1.383^x$

d) $y = \left(\frac{5}{2}\right)^x$

Question 4

The expression log(x) represents the common logarithm of x. What is the value of the base of log(x)?

a) 1

b) 0

c) e

d) 10

Question 5

For which value of x is y = log(x) not defined??

a) X = -9

b) X = 1/9

c) X = 1

d) X = 81

Question 6

Which logarithm is equal to log(3x -1) – 5log(x)?

a) $log\left(\frac{3x-1}{x^5}\right)$

b) $log\left(\frac{3x-1}{5x}\right)$

c) $log(x^5 + 3x - 1)$

Question 7

To increase a given present value, the discount rate should be adjusted:

a) upward.
b) downward.

Question 8

With continuous compounding at 10 percent for 30 years, the future value of an initial investment of $2,000 is closest to

a) $34,898.
b) $40,171.
c) $164,500.
d) $328,282.

Explanation: $FV = \$2000 * e^{(0.10*30)} = \$40.171$

Question 9

In 3 years, you are to receive $5,000. If the interest rate were to suddenly increase, the present value of that future amount to you would

a) fall.
b) rise.
c) remain unchanged.
d) cannot be determined without more information.

Question 10

What is the present value of £520,000 expected to be received in three years' time, if the business concerned requires a return of 10% on sums invested? Answers are given to the nearest £'000.

a) £692k
b) £432k
c) £473k
d) £390k

Question 11

Windsor Ltd is considering a project, which will involve the following cash inflows and (out)flows:

	£'000
Initial outlay	(400)
After one year	40
After two years	300
After three years	300

What will be the NPV (net present value) of this project if a discount rate of 15% is used?

a) +£58.8k

b) -£60.8k

c) +£240k

d) +460.8k