



Family Name	
Given Names	
Student Number	
Teaching Period	Semester 2 Special/Summer Semester, 2016

FINAL EXAMINATION	DURATION
TEP024 – Advanced Foundation Maths	Reading Time: 10 minutes
	Writing Time: 180 minutes

INSTRUCTIONS TO CANDIDATES

- 1.1 All questions are to be answered in the examination booklet provided
- 1.2 Read ALL questions carefully and attempt to answer all 13 questions.
- 1.3 Full working on all questions must be shown.
- 1.4 The maximum mark that can be obtained on the exam is 106 marks.

EXAM CONDITIONS

You may begin writing from the commencement of the examination session. The reading time indicated above is provided as a guide only.

This is a RESTRICTED OPEN BOOK examination

Any calculator is permitted

One A4 sheet of handwritten double-sided notes permitted

Any hard copy, unannotated English dictionary is permitted

ADDITIONAL AUTHORISED MATERIALS	EXAMINATION MATERIALS TO BE SUPPLIED
No additional printed material is permitted	2 x Scrap Paper

**THIS EXAMINATION IS PRINTED
DOUBLE-SIDED.**

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Question 1**[6 Marks]**

- (a) Use index laws to simplify and rewrite the expression with positive indices only. [3]

$$\frac{(3x^{-2}y^3)^3}{y^{-4}} \div \frac{1}{x^6}$$

- (b) Solve for the unknown x and give your answer as a fraction. [3]

$$\frac{3x-6}{5} = 2x - \frac{7}{5}$$

Question 2**[6 Marks]**Given the linear equation $5y + 6x = 11$

- (a) Transpose the equation to rewrite in the form $y = mx + c$. [2]
- (b) State the gradient and the coordinates of the Y intercept for this line. (Answers as fractions if they are not whole numbers). [2]
- (c) Calculate the value of the X intercept and state it's coordinates. [2]

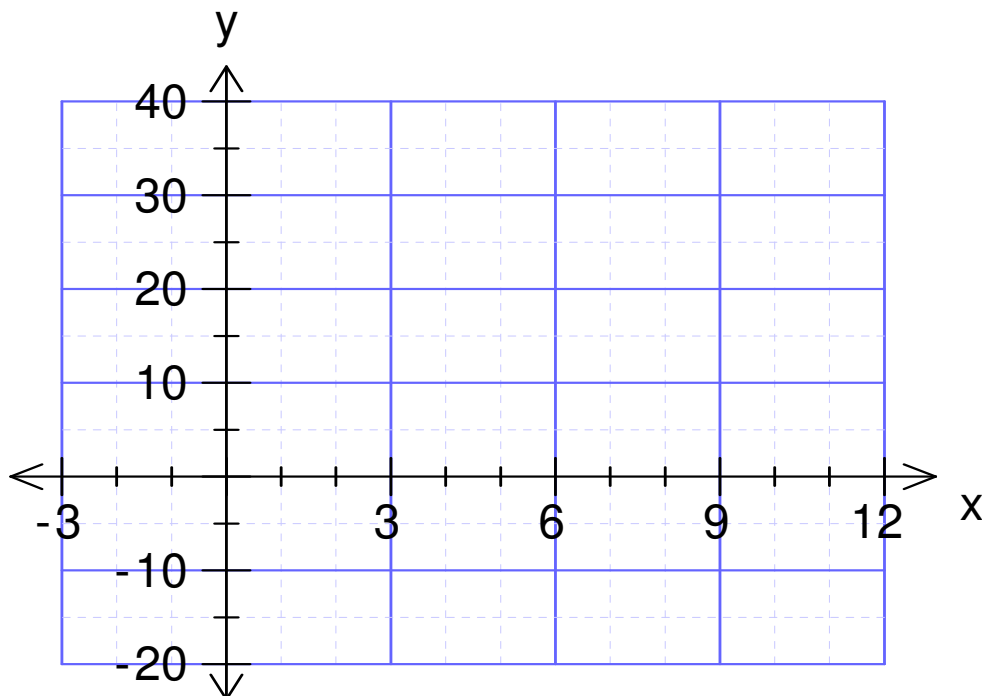
Question 3**[4 Marks]**Solve the following systems of equations algebraically **using the method of elimination for both variables**. Give answers as rational fractions.

$$\begin{aligned}5x + 3y &= 9 \\ -6x + 2y &= -13\end{aligned}$$

Question 4**[12 Marks]**

Expand the following to find an expression for the function in its simplest expanded form.

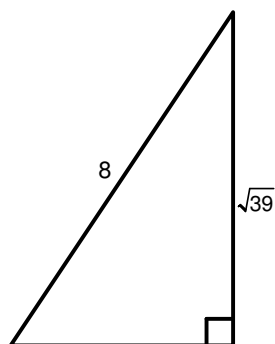
(a) $f(x) = (10 - x)(x + 2)$ [2]

(b) State the coordinates of the X and Y intercepts for the function $f(x) = (10 - x)(x + 2)$. [3](c) Plot the axis intercepts of $y = (10 - x)(x + 2)$ on the axes below labelling each with its coordinates. [3](d) **Algebraically determine** the coordinates of the turning point of $y = (10 - x)(x + 2)$. [2]

(e) Add this point to the graph above labelling it with its coordinates, and complete the graph of the function. [2]

Question 5**[5 Marks]**

Solve $4x^2 - 6x + 1 = 2x^2 - 12x$ using the quadratic formula. Give your answer in simplest surd form.

Question 6**[4 Marks]**

(a) Find all the angles in the triangle. [2]

(b) Using trigonometric ratios, find the length of the unknown side. [2]

Question 7**[12 Marks]**

(a) Rewrite $3\log 2 - \log 5 + 2$ as a single logarithm.

[4]

(b) Simplify $\frac{\log 64}{\log 32}$ **without the use of a calculator.**

[2]

(c) Solve the following equation for x **without the use of logarithms.**

[3]

$$2^{3x-1} = \frac{1}{16}$$

(d) Solve the following equation for t (correct to 3 sig. figs.)

[3]

$$2e^{0.54t} = 100$$

Question 8**[6 Marks]**

A plane traverses a distance between two points, A and B, in the sky. Viewed by a stationary observer on the ground the angular distance between the two points is 0.075 radians. The distance of the plane from the point of observation is 6 km.

(a) Draw your own labelled sketch to best represent this situation. [2]

(b) Determine the distance travelled by the plane in metres and kilometres. [2]

(c) Determine the speed of the plane in km/h, if the time taken to traverse the distance is 3 seconds. [2]

Question 9**[11 Marks]**

(a) If $\sin\beta = -0.687$ and $0^\circ \leq \beta \leq 360^\circ$ find β as positive angle/s.

[4]

(b) Given $\tan\theta = +1.25$, and that the value of $\cos\theta$ is negative, find θ .
Give your answer for θ in degrees and radians.

[4]

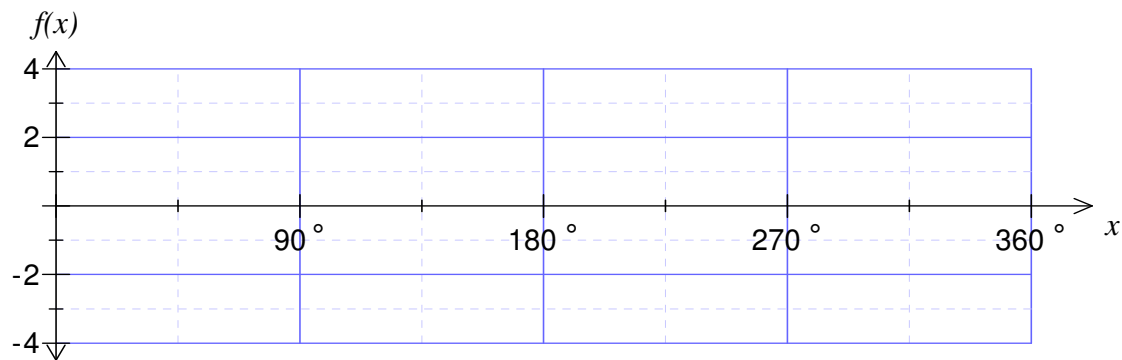
(c) Solve $-15\cos(2x+10) = 5$ for $0^\circ \leq x \leq 90^\circ$.

[3]

Question 10**[10 Marks]**Given the function $f(x) = -3\sin 2x$.

(a) State the value of the amplitude and the period of the function. [2]

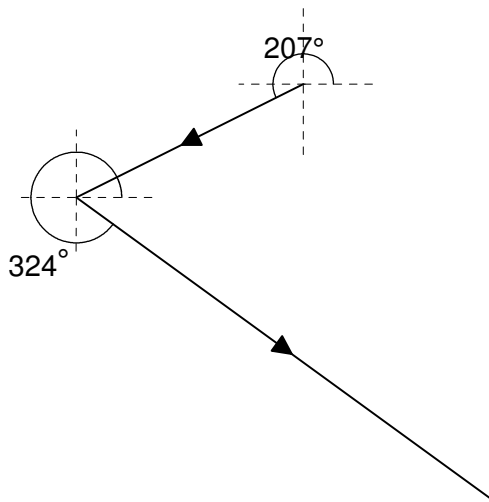
(b) Sketch the graph of the function on the axes given below. [2]

(c) Calculate the values for which $f(x) = -3\sin 2x = 1.5$, for $0^\circ \leq x \leq 180^\circ$. [4]

(d) Plot the coordinates for your solution to part (c) on your graph above. [2]

Question 11**[10 Marks]**

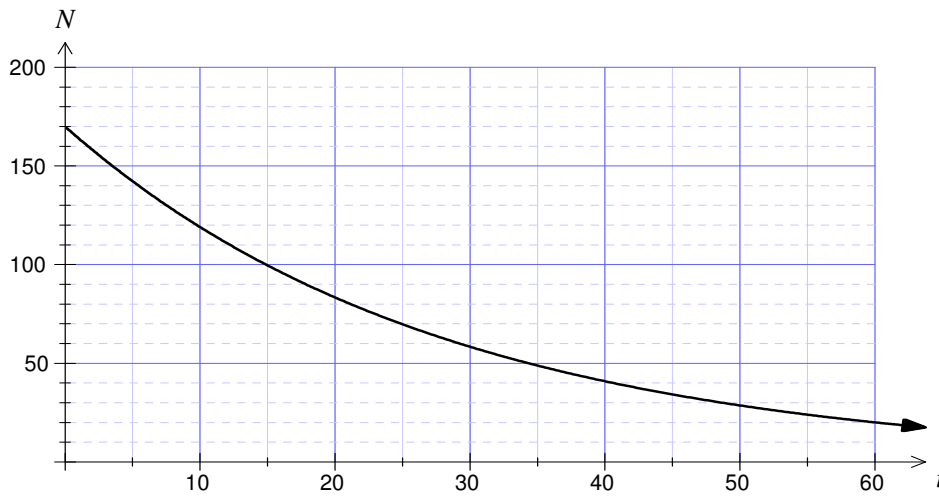
- (a) Two velocity vectors 33.5ms^{-1} 207° and 68.0ms^{-1} 324° are added. Complete [3]
the diagram below which is to scale, and hence determine the magnitude and
direction of the resultant velocity by measurement. SCALE: $1\text{cm} : 10\text{ms}^{-1}$.



- (b) Use your knowledge of trigonometry to verify your answer in part (a) above. [7]
Answers for length correct to 3 sig figs.

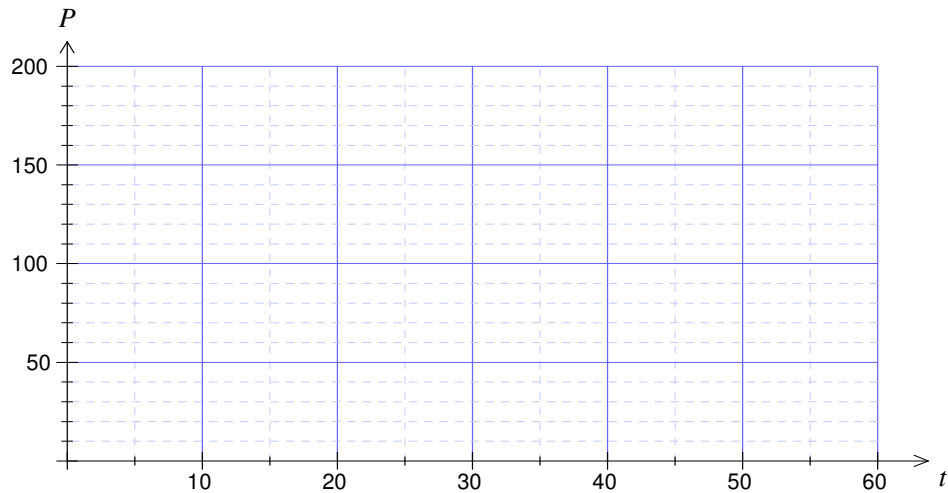
Question 12**[14 Marks]**

Drawn below is the graph of the function $N(t) = 170(0.965)^t$ where N represents the number of termites in a laboratory termite mound over time, t , in weeks. These termites are given little food and experience poor living conditions.



- (a) (i) Calculate the initial value of N , ie $N(0)$. [1]
- (ii) Plot this point on your graph labelling the point with its coordinates. [1]
- (b) (i) Calculate the number of termites after one year. [1]
- (ii) Plot this point on the graph labelling it with its coordinates. [1]
- (c) **Determine algebraically** how many weeks it will take for the number of termites in the mound to decrease to 25% of the original number [4]

- (d) In the same laboratory another mound of termites is given the choice slivers of bark and wood to eat and ideal living conditions. Their numbers are found to increase over time (t , in weeks) according to the model $P(t) = 50(1.026)^t$. Plot the graph for this model on the axes given below. Show at least 3 points along the curve labelling each point with its coordinates. [2]



- (e) At some point in time the number of termites in both mounds will be equal. Determine when that will be to the nearest whole week and how many termites there will be in each colony at that time. [4]
 i.e. Solve $170(0.965)^t = 50(1.026)^t$

Question 13**[6 Marks]**Given the logarithmic equation $\ln M = \ln 16 - 0.25t$

(a) Rewrite the equation as an exponential equation.

[3]

(b) Solve for t when $M = 4$.

[3]