



Teacher's Name: Students Circle

SEMESTER 2 EXAMINATIONS - NOVEMBER 2017

Reading time:

Writing time:

Marks Allocated:

Sections within Booklet	Number of Questions	Number of Marks

Specific Instructions

Supplies and Equipment

Supplies: Please ensure you have the correct supplies/instruments for taking the examination before you enter the examination venue (e.g. pencils, pens, calculator, ruler, etc). There will be no sharing allowed. No other paper, etc. will be allowed to come in with you unless instructed as Specific Instructions. A clear bottle containing only water is permissible.

At the Conclusion: Please wait quietly for specific instruction as to how you will be dismissed. Leave your examination paper on your table. Pick up unwanted papers around you, push your chair under the table, and put your rubbish in the bin on your way out of the examination room.

Short Answer

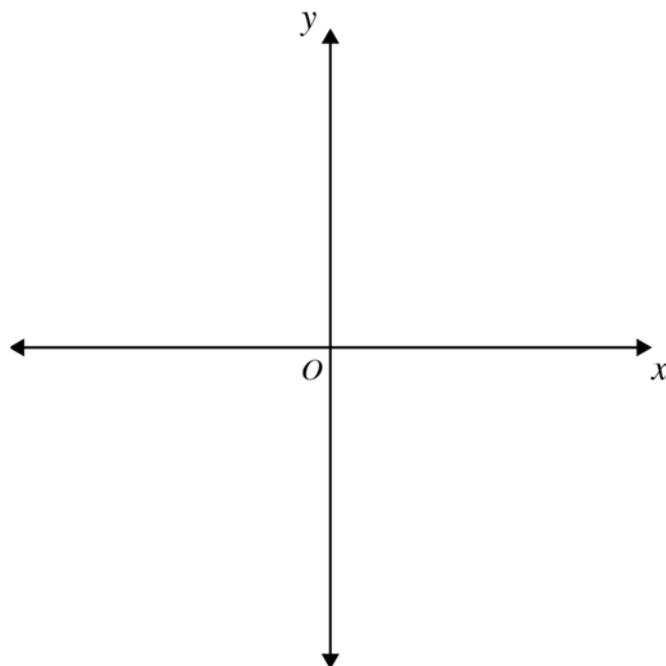
Working required where appropriate:

Question 1 (7 marks)

Let $f: \mathbb{R} \rightarrow \mathbb{R}$, $f(x) = 2^x - 4$

- a. On the set of axes below, sketch the graph of $y = f(x)$. Indicate clearly the coordinates of any axes intercepts as well as the equation of any asymptotes.

3 marks



- b. Write down

- i. the domain of f . 1 mark

- ii. the range of f . 1 mark

- a. Find the rule for f^{-1} . 2 marks

Question 2 (8 marks)

Solve the following for x .

a. $2^{3x+2} = \frac{1}{4}$ 2 marks

b. $3^{2x} - 10 \times 3^x + 9 = 0$ 2 marks

c. $\log_3(x^2 - 3x + 1) = 0$ 2 marks

d. $\log_{10}(x) - 2 \log_{10}(5) + \log_{10}(2) = 0$ 2 marks

Question 3 (3 marks)

a. Evaluate

i. $\cos\left(\frac{5\pi}{3}\right)$ 1 mark

ii. $\sin\left(-\frac{3\pi}{4}\right)$ 1 mark

b. Given $\sin(\theta) = 0.8$ and $\frac{\pi}{2} < \theta < \pi$, evaluate $\cos(\theta)$ 1 mark

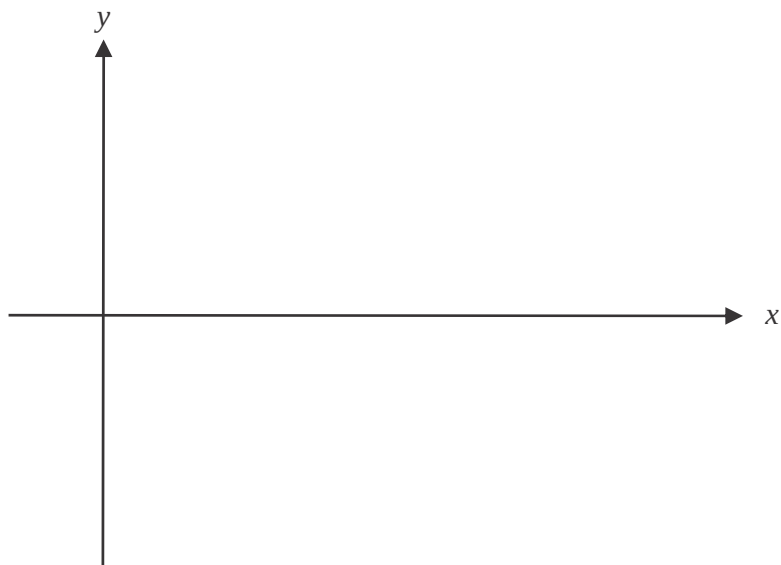
Question 4 (5 marks)

a. Solve $2\sin(2x)+1=0$ for $x \in [0, 2\pi]$.

2 marks

b. On the set of axes below, sketch the graph of $y = 2\sin(2x) + 1$ for $x \in [0, 2\pi]$.
Label endpoints, x-intercepts, and turning points clearly.

3 marks



Question 5 (3 marks)

- a.** Find the derivative of $2x^2 - 3x + 1$ with respect to x . 1 mark

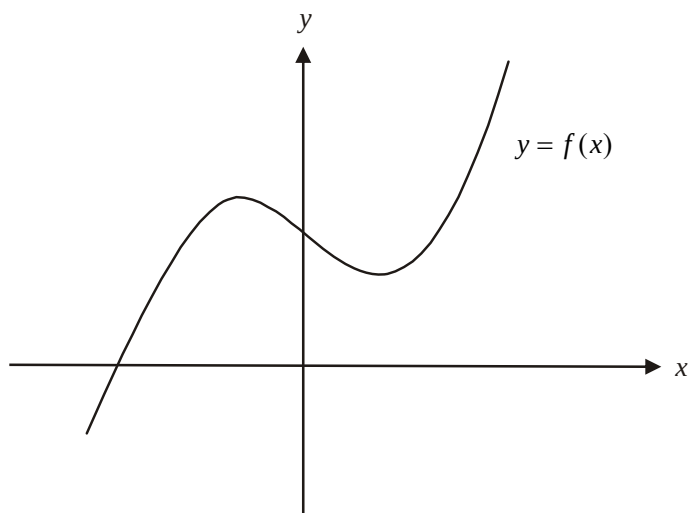
- b.** Let $f(x) = \frac{8}{x^3} + 4\sqrt{x}$, $x \neq 0$. 1 mark

- i.** Show that $f'(x) = -\frac{24}{x^4} + \frac{2}{\sqrt{x}}$

- ii.** Evaluate $f'(1)$. 1 mark

Question 6 (5 marks)

The graph of the function $f(x) = ax^3 + bx + 1$, where a and b are constants is shown below.



The graph passes through the point $(1, 2)$ and has a gradient of 5 at this point.

- a. Show that $a = 2$ and $b = -1$.

3 marks

Question 6 (cont'd)

- b.** Find the average rate of change of the function between $x = -1$ and $x = 1$. 1 mark

- c.** Find the x-coordinates of the turning point of $f(x)$. 1 mark

Question 7 (3 marks)

The curve $y = \frac{1}{x}$, $x > 0$ undergoes a sequence of transformations defined by T such that

$$T\left(\begin{bmatrix} x \\ y \end{bmatrix}\right) = \begin{bmatrix} -3 & 0 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}.$$

- a.** Find the equation of the image of the curve after it has undergone the sequence of transformations. 2 marks

- b.** Describe **one** of the transformations that the curve undergoes. 1 mark

Question 8 (6 marks)

- a. The graph of $y = 2x^3 + 3x^2 - 12x + 5$ has two stationary points. Find the x -coordinate of each stationary point.

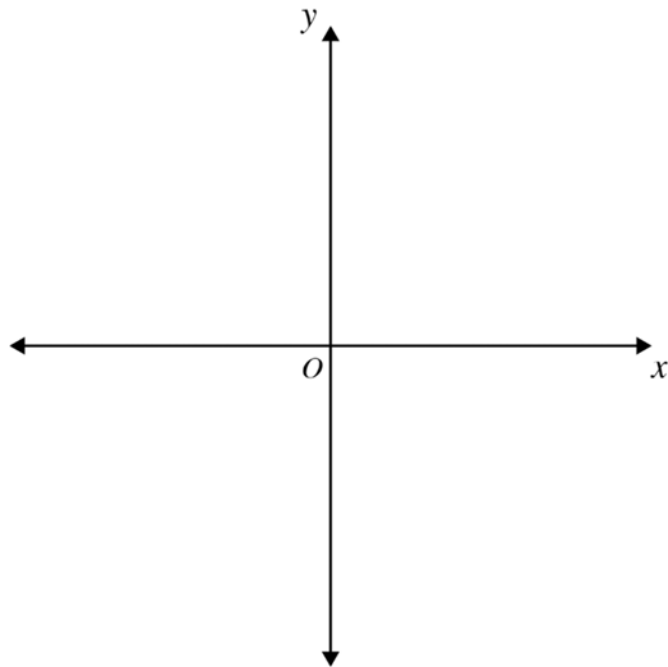
2 marks

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- b. Sketch the graph of $h : [0, 2] \rightarrow \mathbb{R}, h(x) = 2x^3 + 3x^2 - 12x + 5$. Label the y intercept, the turning point and endpoints with coordinates.

2 marks

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- c. Find the values of x for which the gradient of the graph $h : [0, 2] \rightarrow \mathbb{R}, h(x) = 2x^3 + 3x^2 - 12x + 5$ is negative.

2 marks

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END OF SECTION A