KAMBALA

Student Number: _____

Yearly Examination
September 2020

Preliminary Mathematics Advanced

General Instructions

- Reading time – 10 minutes
- Working time – 2 hours
- Write using black pen
- Board-approved calculators may be used
- A Reference Sheet is provided for use in this task
- Answer questions 1 – 10 on the answer sheet provided
- Answer questions 11 through 26 on the paper provided
- For questions 11 through 26, show relevant mathematical reasoning and/or calculations

Total marks – 70

Section I
10 marks

- Attempt Questions 1 – 10
- Allow about 15 minutes for this section

Section II
60 marks

- Attempt Questions 11 through 26
- Allow about 1 hour and 45 minutes for this section

Section I

10 marks
Attempt questions 1-10.
Allow about 15 minutes for this section.

Use the answer sheet for Questions 1 – 10.

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1. What is the value of $\sqrt{48} - \sqrt{12}$?

   (A) 2

   (B) $2\sqrt{3}$

   (C) $2\sqrt{6}$

   (D) 6

2. What are the x intercepts of the parabola $y = x^2 - 2x - 3$?

   (A) -3 and -1

   (B) -3 and 1

   (C) -1 and 3

   (D) 1 and 3

3. What are the solutions of the equation $|2x + 1| - 3 = 0$?

   (A) $x = 2$ or $x = -1$

   (B) $x = -2$ or $x = -1$

   (C) $x = -2$ or $x = 1$

   (D) $x = 2$ or $x = 1$

4. What is the perimeter of a sector of a circle of radius 6cm which contains a sector angle of $\frac{\pi}{6}$ radians at the centre of the circle?

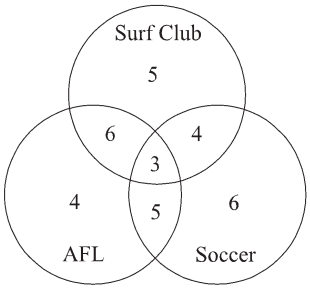
   (A) π cm

   (B) 3π cm

   (C) $(12 + \pi)$ cm

   (D) $(12 + 3\pi)$ cm

5. In a classroom, students are asked what sports club they are members of and the results are shown in the Venn diagram.



A student who is a member of the soccer club is chosen at random. What is the probability that he/she is also a member of a surf club?

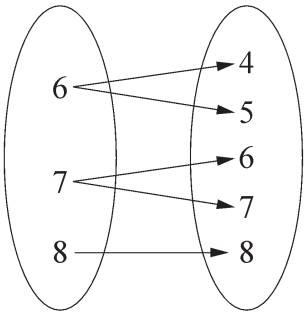
(A) $\frac{2}{5}$

(B) $\frac{4}{11}$

(C) $\frac{2}{9}$

(D) $\frac{7}{18}$

6. What type of relation is this?



(A) Many-to-many

(B) One-to-many

(C) One-to-one

(D) Many-to-one

7. If $y = \sqrt{2x + 1}$ what is the expression for $\frac{dy}{dx}$?

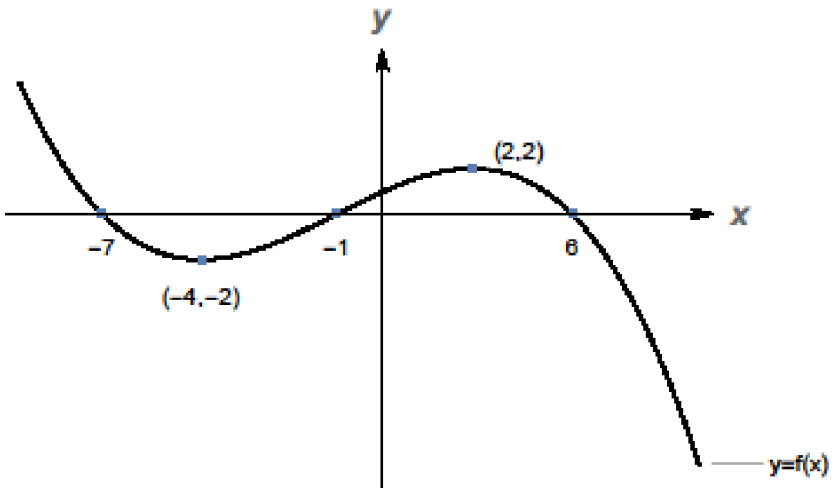
(A) $\frac{dy}{dx} = 2\sqrt{2x + 1}$

(B) $\frac{dy}{dx} = \frac{1}{2\sqrt{(2x+1)}}$

(C) $\frac{dy}{dx} = \frac{1}{\sqrt{(2x+1)}}$

(D) $\frac{dy}{dx} = \frac{2}{\sqrt{(2x+1)}}$

8.



For the graph $y = f(x)$ shown above, $f'(x)$ is negative when

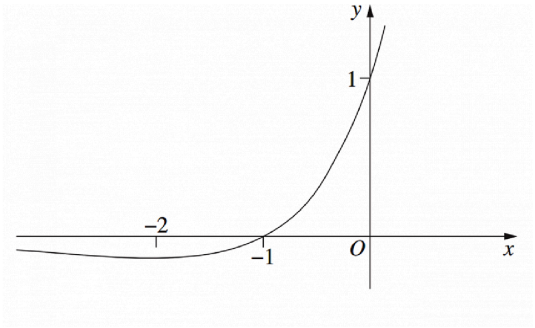
(A) $-7 < x < -1$ or $x > 6$

(B) $x < -4$ or $x > 2$

(C) $-4 < x < 2$

(D) $-2 < x < 2$

9. The diagram shows the graph of $y = e^x(1 + x)$ below.



How many solutions to $y = e^x(1 + x) = 1 - x^2$?

(A) 0

(B) 1

(C) 2

(D) 3

10. If $a = e^x$ what is the correct expression for $log_e \frac{1}{a^2}$?

(A) $-x^2$

(B) $-2x$

(C) $2x$

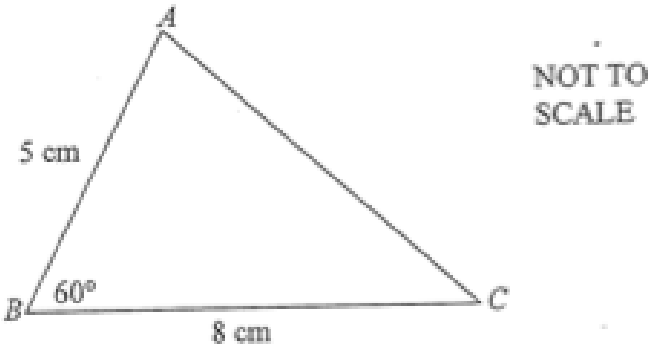
(D) x^2

Section II

60 marks
Attempt all questions.
Allow about 1 hour and 45 minutes for this section.

Answer the questions in the spaces provided.
Your responses should include relevant mathematical reasoning and/or calculations.
Extra writing space is provided at the back of the examination paper.

Question 11 (3 marks)



ABC is a triangle in which AB = 5cm, BC = 8cm and $\angle ABC = 60°$

(a) Find the length of AC. **2**

(b) Find in simplest exact form the area of ΔABC **1**

Question 12 (2 marks)

(a) Solve for x

$\frac{x-2}{4} + \frac{7-x}{6} = 1$ **2**

Question 13 (2 marks)

A$(-2, 1)$, B$(2, -1)$ and C $(4, 3)$ are the vertices of a triangle. Show that AB $\perp$ BC . **2**

Question 14 (2 marks)

A fair die is rolled once. A is the event *the score is even* and B is the event *a multiple of 3.* Explain whether events A and B are independent. **2**

Question 15 (3 marks)

(a) If $f(x) = 4 - x^2$ and $g(x) = \sqrt{x}$ find the composite function $f(g(x))$. **1**

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.....

(b) Sketch the graph of this composite function showing the x and y intercepts. **2**

Question 16 (5 marks)

(a) Differentiate **1**

$x^4 + 2x^2 + 10$

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(b) Differentiate **2**

$e^x(x^2 + 1)$

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(c) Differentiate **2**

$\frac{4x^2}{1-x}$

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Question 17 (5 marks)

There are twelve chocolates in a box. Four of the chocolates have mint centres and eight have caramel centres. Ali randomly selects two chocolates and eats them.

(a) Draw a tree diagram **2**

(b) What is the probability that the two chocolates have mint centres? **1**

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(c) What is the probability that the two chocolates have the different centres? **2**

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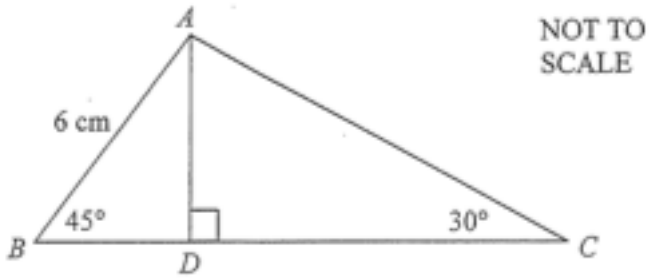
Question 18 (2 marks)

Sketch the graph of the function $f(x) = 1 - log_e x$ showing the x intercept and the equation of the asymptote. **2**

Question 19 (4 marks)



In the diagram, ABC is a triangle in which $\angle ABC = 45°$, $\angle ACB = 30°$ and AB = 6 cm. ADS is the perpendicular from A to BC.

(a) Find in simplest exact form the length of AD. **2**

(b) Find in simplest exact form the length of DC. **2**

Question 20 (2 marks)

What is the domain of the function $f(x) = \frac{1}{x^2-4}$ **2**

Question 21 (2 marks)

Use the formula $S = V_0(1 - r)^n$ to find correct to 2 decimal places the time (n years) it takes for an item with initial value $V_0 = \$2000$ to depreciate to the value S=$100 at an annual rate of depreciation $r = 10\%$. **2**

Question 22 (2 marks)

(a) Solve x for the domain $0 \leq x \leq 2\pi$ **2**

$2\sin x + \sqrt{3} = 0$

Question 23 (3 marks)

Find the coordinates of the point where the gradient of the tangent is zero, on the curve

$y = (x - 1)(x - 2)^3$ **3**

Question 24 (2 marks)

Use the formula $f'(x) = \frac{f(x+h)-f(x)}{h}$ to find $f'(x)$ when $f(x) = x^2 - 2x$. **2**

Question 25 (3 marks)

Show that $\frac{1}{1+\sin x} + \frac{1}{1-\sin x} = 2sec^2 x$ **3**

Question 26 (3 marks)

(a) Show that the function $f(x) = |x| - 1$ is even. **1**

(b) Sketch the graph of the curve $f(x) = |x| - 1$ showing the intercepts on the axes. **2**

Question 27 (4 marks)

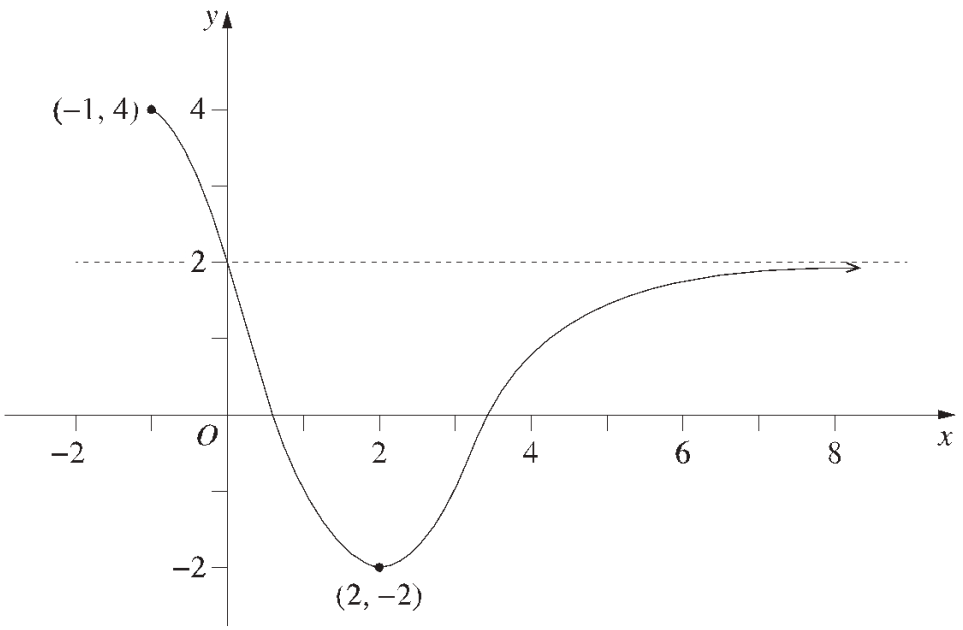
(a) Find the equation of the tangent to the curve $y = \frac{8}{3x-1}$ at the point where $x = 1$. **3**

(b) Find the angle of inclination of this tangent correct to the nearest degree. **1**

Question 28 (2 marks)

2

The graph of a function $f(x)$ is shown. It has an asymptote at $y = 2$.



State the domain and range of $f(x)$

Question 29 (4 marks)

For a certain brand of medicine, the amount M present in the blood after t hours is given by $M = 3t^2 - t^3$, for $0 \leq t \leq 3$

(a) Find the average rate of change between $t = 0$ and $t = 3$ **2**

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(b) Find the instantaneous rate of change $\frac{dM}{dt}$ at $t = 1$ **2**

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Question 30 (2 marks)

2

Solve for $x \quad log_2(x + 1) + log_2(x - 1) = 3$.

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Question 31 (3 marks)

The energy, E Megajoules, radiated by an earthquake is given by the formula $E = k\times10^{1.5M}$ where M is the magnitude of the earthquake on the Richter scale And k is a constant. An earthquake of magnitude 1 radiates 2 Megajoules of energy.

(a) Show that $log_{10}E = log_{10}2 + 1.5(M - 1)$. **2**

(b) Find the magnitude of an earthquake which radiates 2×10^{6} Megajoules of energy. **1**

End of paper

Section II extra writing space

If you use this space, clearly indicate which question you are answering.

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Student Number: _____

Preliminary Mathematics Advanced

Yearly Examination
September 2020

Section I

Multiple-Choice Answer Sheet

Circle the answer of your choice.

1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D

4.	A	B	C	D
5.	A	B	C	D
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D

AJ - MC & Q11
PS - Q12 - 18
KH - Q19 - 25
SU - Q26 - 31

KAMBALA

Student Number: _____

Final with Solutions
7-9-20

Yearly Examination
September 2020

Preliminary Mathematics Advanced

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Total marks – ~~70~~ 70

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10 marks
- Attempt Questions 1 – 10
- Allow about 15 minutes for this section

Section II
60 marks
- Attempt Questions 11 through 26
- Allow about 1 hour and 45 minutes for this section

Section I

10 marks
Attempt questions 1-10.
Allow about 15 minutes for this section.

Use the answer sheet for Questions 1 – 10.

---

1. What is the value of $\sqrt{48} - \sqrt{12}$?

   (A) 2

   (B) $\sqrt{12}$

   (C) $\sqrt{24}$

   (D) 6

$4\sqrt{3} - 2\sqrt{3} = 2\sqrt{3} = \sqrt{12}$

2. What are the x intercepts of the parabola $y = x^2 - 2x - 3$?

   (A) -3 and -1

   (B) -3 and 1

   (C) -1 and 3

   (D) 1 and 3

$x^2 - 2x - 3 = 0$
$(x-3)(x+1) = 0$
$x = 3$ and -1

3. What are the solutions of the equation $|2x + 1| - 3 = 0$?

   (A) $x = 2$ or $x = -1$

   (B) $x = -2$ or $x = -1$

   (C) $x = -2$ or $x = 1$

   (D) $x = 2$ or $x = 1$

$|2x+1| = 3$
$2x+1 = 3$ or $2x+1 = -3$
$2x = 2$ $\quad$ $2x = -4$
$x = 1$ $\quad$ $x = -2$

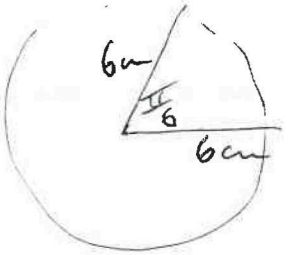
4. What is the perimeter of a sector of a circle of radius 6cm which contains a sector angle of $\frac{\pi}{6}$ radians at the centre of the circle?

   (A) π cm

   (B) 3π cm

   (C) $(12 + \pi)$ cm

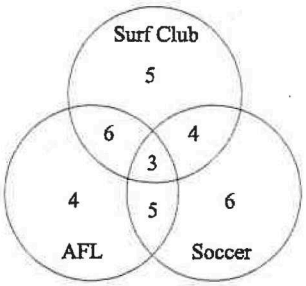
   (D) $(12 + 3\pi)$ cm



$l = r\theta = 6 \times \frac{\pi}{6} = \pi$ cm

$P = 6 + 6 + \pi$
$= 12 + \pi$

5. In a classroom, students are asked what sports club they are members of and the results are shown in the Venn diagram.



A student who is a member of the soccer club is chosen at random. What is the probability that he/she is also a member of a surf club?

(A) $\frac{2}{5}$

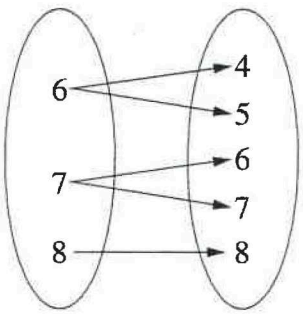
(B) $\frac{4}{11}$

(C) $\frac{2}{9}$

(D) $\frac{7}{18}$

$\frac{7}{18}$ $\frac{\text{surfd soccer}}{\text{soccer}}$

6. What type of relation is this?



(A) Many-to-many

(B) One-to-many

(C) One-to-one

(D) Many-to-one

7. If $y = \sqrt{2x+1}$ what is the expression for $\frac{dy}{dx}$?

$\frac{dy}{dx} = \frac{1}{2} \times 2(2x+1)^{-\frac{1}{2}}$

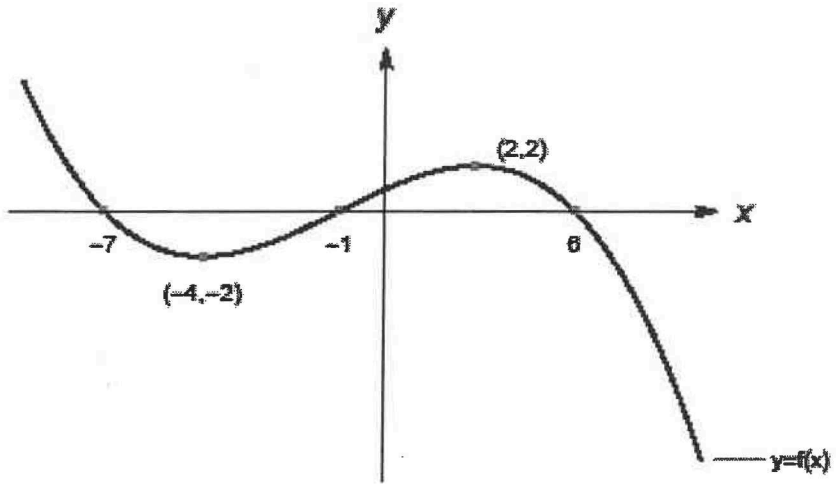
(A) $\frac{dy}{dx} = 2\sqrt{2x+1}$

(B) $\frac{dy}{dx} = \frac{1}{2\sqrt{(2x+1)}}$

(C) $\frac{dy}{dx} = \frac{1}{\sqrt{(2x+1)}}$

(D) $\frac{dy}{dx} = \frac{2}{\sqrt{(2x+1)}}$

8.



For the graph $y = f(x)$ shown above, $f'(x)$ is negative when

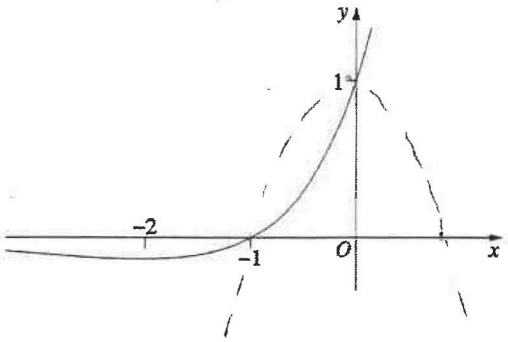
(A) $-7 < x < -1$ or $x > 6$

(B) $x < -4$ or $x > 2$

(C) $-4 < x < 2$

(D) $-2 < x < 2$

9. The diagram shows the graph of $y = e^x(1 + x)$ below.



How many solutions to $y = e^x(1 + x) = 1 - x^2$?

$1 - x^2 = 0$

$x^2 = 1$

$x = \pm 1$

(A) 0

(B) 1

(C) 2

(D) 3

10. If $a = e^x$ what is the correct expression for $log_e \frac{1}{a^2}$?

$\log_e \frac{1}{(e^x)^2} = \log_e e^{-2x}$

$= -2x$

(A) $-x^2$

(B) $-2x$

(C) $2x$

(D) x^2

Section II

60 marks
Attempt all questions.
Allow about 1 hour and 45 minutes for this section.

Answer the questions in the spaces provided.
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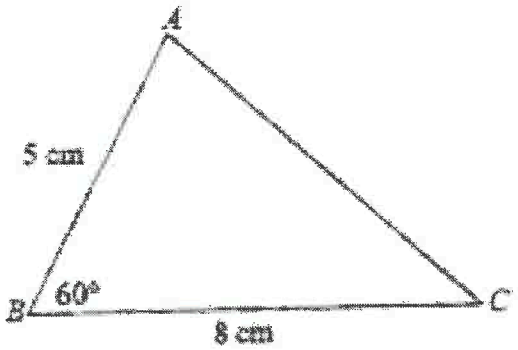
Question 11 (3 marks)



NOT TO SCALE

ABC is a triangle in which AB = 5cm, BC = 8cm and $\angle ABC = 60°$

(a) Find the length of AC. **2**

$b^2 = 5^2 + 8^2 - 2(5)(8)\cos 60°$
$= 25 + 64 - 80 \times \frac{1}{2}$
$= 49$
$b = 7$
$AC = 7$ cm

(b) Find in simplest exact form the area of ΔABC **1**

Area $= \frac{1}{2}(5)(8)\sin 60$
$= 20 \times \frac{\sqrt{3}}{2}$
$= 10\sqrt{3}$ cm^2

Question 12 (2 marks)

(a) Solve for x

$\frac{x-2}{4} + \frac{7-x}{6} = 1$ **2**

$3(x-2) + 2(7-x) = 12$

$3x - 6 + 14 - 2x = 12$

$x + 8 = 12$

$x = 4$

Question 13 (2 marks)

A(−2,1), B(2, −1) and C (4,3) are the vertices of a triangle. Show that AB ⊥ BC. **2**

m_1 = Gradient AB $= \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1-1}{2+2} = \frac{-2}{4} = -\frac{1}{2}$

m_2 = Gradient BC $= \frac{3+1}{4-2} = \frac{4}{2} = 2$

$m_1 m_2 = -\frac{1}{2} \times 2 = -1 \therefore AB \perp BC$

$P(\text{even}) = \frac{1}{2}$

$P(\text{multiple 3}) = \frac{1}{3}$

Question 14 (2 marks)

A fair die is rolled once. A is the event *the score is even* and B is the event *a multiple of 3.* Explain whether events A and b are independent. **2**

$A = \{2, 4, 6\}$ $P(A) = \frac{3}{6} = \frac{1}{2}$ ✓

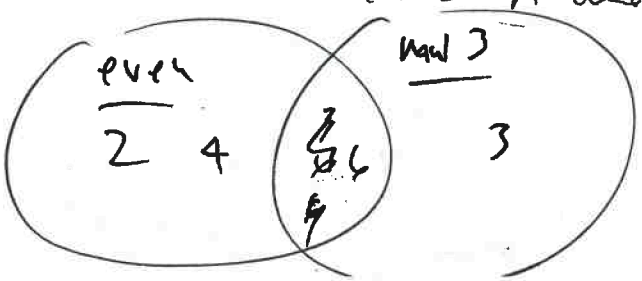
$B = \{3, 6\}$ $P(B) = \frac{2}{6} = \frac{1}{3}$

$A \cap B = \{3\}$ $P(A \cap B) = \frac{1}{6}$

$P(A \cap B) = P(A) \times P(B)$

$\frac{1}{6} = \frac{1}{2} \times \frac{1}{3}$

Yes A and B are independent events



$P(\text{even} \mid \text{multiple}) = \frac{1}{2}$

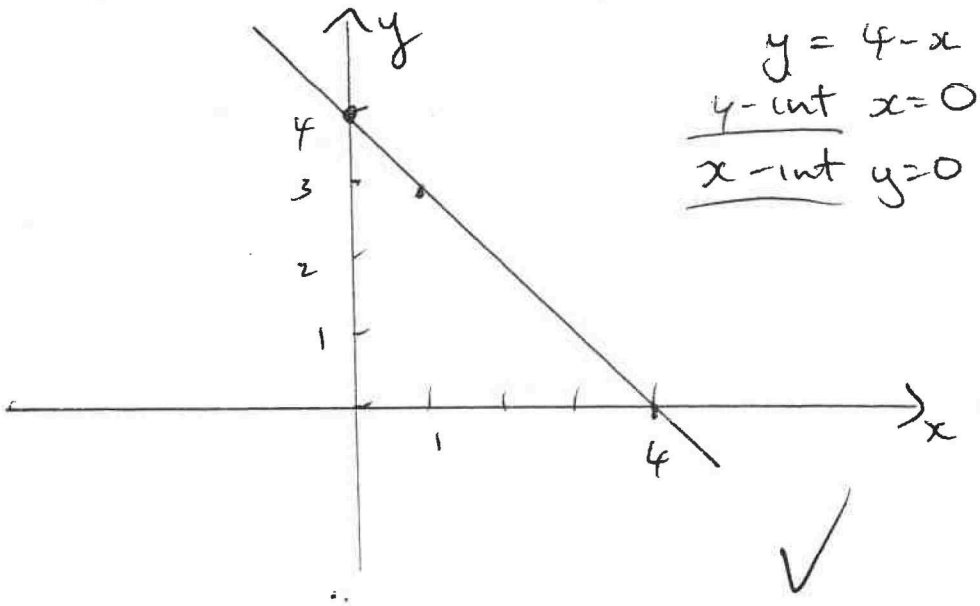
$P(\text{multiple 3} \mid \text{even}) = \frac{1}{3}$

Question 15 (3 marks)

(a) If $f(x) = 4 - x^2$ and $g(x) = \sqrt{x}$ find the composite function $f(g(x))$. **1**

$f(g(x)) = 4 - (\sqrt{x})^2 = 4 - x$

(b) Sketch the graph of this composite function showing the x and y intercepts. **2**



$y = 4 - x$

y-int $x = 0$ $y = 4$

x-int $y = 0$ $x = 4$

✓

Question 16 (5 marks)

(a) Differentiate **1**

$x^4 + 2x^2 + 10$ $\quad \frac{dy}{dx} = 4x^3 + 4x$ ✓

(b) Differentiate **2**

$e^x(x^2 + 1)$ $\quad \frac{dy}{dx} = e^x \times 2x(x^2+1) + e^x(x^2+1)^2$

$= e^x(x^2+1)(4x + x^2 + 1)$

$e^x(x^2+1)$ $\quad \frac{dy}{dx} = e^x \times 2x + e^x \times (x^2+1)$

$= 2xe^x + e^x(x^2+1)$

(c) Differentiate **2**

$\frac{4x^2}{1-x} = \frac{u}{v}$ $\quad \frac{dy}{dx} = \frac{(1-x)\times 8x - 4x^2(-1)}{(1-x)^2}$

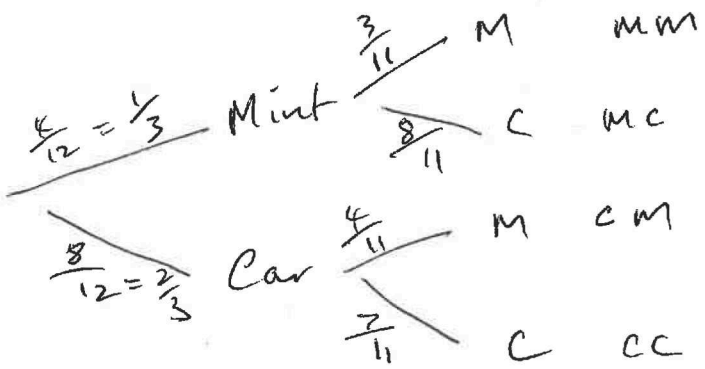
$= \frac{8x - 8x^2 + 4x^2}{(1-x)^2}$

$= \frac{8x - 4x^2}{(1-x)^2}$

Question 17 (5 marks)

There are twelve chocolates in a box. Four of the chocolates have mint centres and ~~four~~ eight have caramel centres. Ali randomly selects two chocolates and eats them.

(a) Draw a tree diagram **2**



(b) What is the probability that the two chocolates have mint centres? **1**

$P(MM) = \frac{1}{3} \times \frac{3}{11} = \frac{1}{11}$

(c) What is the probability that the two chocolates have the different centres? **2**

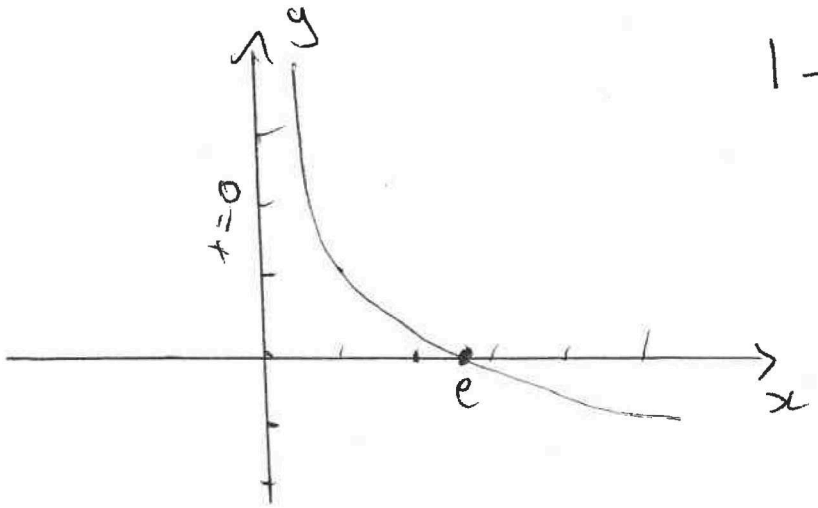
$P(MC) + P(CM) = \frac{1}{3} \times \frac{8}{11} + \frac{2}{3} \times \frac{4}{11}$

$= \frac{8}{33} + \frac{8}{33}$

$= \frac{16}{33}$

Question 18 (2 marks)

Sketch the graph of the function $f(x) = 1 - log_e x$ showing the x intercept and the equation of the asymptote. **2**



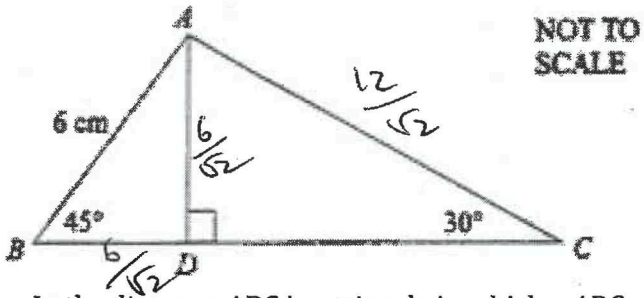
$1 - \log_e x = 0$

$\log_e x = 1$

$e^1 = x$

$x = 2.7\ldots$

Question 19 (4 marks)



In the diagram, ABC is a triangle in which $\angle ABC = 45°$, $\angle ACB = 30°$ and AB = 6 cm. ADS is the perpendicular from A to BC.

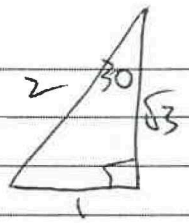
(a) Find in simplest exact form the length of AD. **2**

$AD = \frac{6}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{6\sqrt{2}}{2} = 3\sqrt{2}$

(b) Find in simplest exact form the length of DC. **2**

$DC = 3\sqrt{2} \times \sqrt{3}$

$= 3\sqrt{6}$



Question 20 (2 marks)

What is the domain of the function $f(x) = \frac{1}{x^2-4}$ **2**

All real except $x = \pm 2$

Question 21 (2 marks)

Use the formula $S = V_0(1-r)^n$ to find correct to 2 decimal places the time (n years) it takes for an item with initial value $V_0 = \$2000$ to depreciate to the value S=\$100 at an annual rate of depreciation $r = 10\%$. **2**

$100 = 2000\left(1 - 0.1\right)^n$

$\frac{100}{2000} = 0.9^n$

$\log \frac{1}{20} = n \log 0.9$

$\frac{\log \frac{1}{20}}{\log 0.9} = n$

$n = 28.43$ years

Question 22 (2 marks)

(a) Solve x for the domain $0 \leq x \leq 2\pi$ **2**

$2\sin x + \sqrt{3} = 0$

$2\sin x = -\sqrt{3}$

$\sin x = -\frac{\sqrt{3}}{2}$

ref angle $= \frac{\pi}{3}$ or $60°$

S	A
T ✓	C ✓

$x = \pi + \frac{\pi}{3}, \quad 2\pi - \frac{\pi}{3}$

$= \frac{4\pi}{3}, \quad \frac{5\pi}{3}$

Question 23 (3 marks)

Find the coordinates of the point where the gradient of the tangent is zero, on the curve

$y = (x-1)(x-2)^3$ **3**

$\frac{dy}{dx} = (x-1) \times 3(x-2)^2 + (x-2)^3 \times 1$

$= (x-2)^2\left(3(x-1) + (x-2)\right)$

$= (x-2)^2(3x - 3 + x - 2)$

$= (x-2)^2(4x - 5) = 0$

$4x - 5 = 0$

$x = 2 \text{ or } x = \frac{5}{4}$

Question 24 (2 marks)

Use the formula $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ to find $f'(x)$ when $f(x) = x^2 - 2x$. **2**

$$f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$$

$$= \lim_{h\to 0} \frac{(x+h)^2 - 2(x+h) - (x^2 - 2x)}{h}$$

$$= \lim_{h\to 0} \frac{x^2 + 2xh + h^2 - 2x - 2h - x^2 + 2x}{h}$$

$$= \lim_{h\to 0} \frac{h(2x + h - 2)}{h}$$

$$= \lim_{h\to 0} 2x + h - 2 \qquad f'(x) = 2x - 2$$

Question 25 (3 marks)

Show that $\frac{1}{1+\sin x} + \frac{1}{1-\sin x} = 2sec^2x$ **3**

$$LHS = \frac{1 - \sin x + 1 + \sin x}{(1+\sin x)(1-\sin x)}$$

$$= \frac{2}{1 - \sin^2 x}$$

$$= \frac{2}{\cos^2 x}$$

$$= 2\sec^2 x$$

$$= RHS.$$

Question 26 (3 marks)

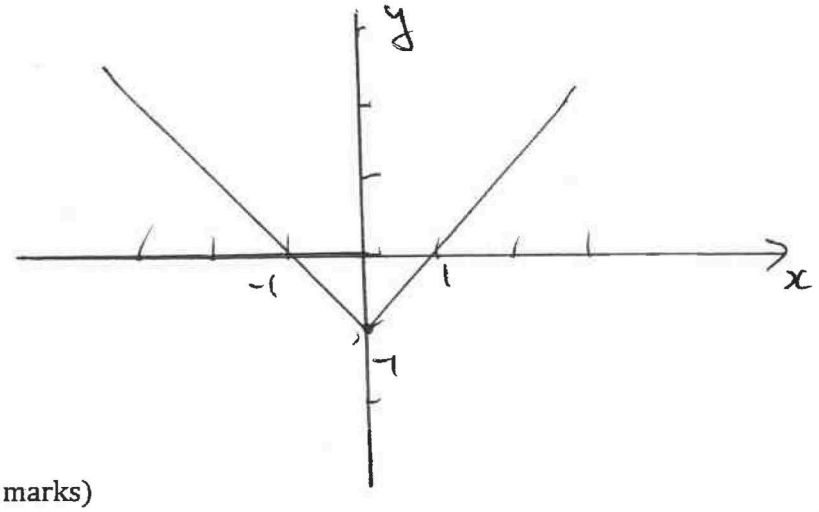
(a) Show that the function $f(x) = |x| - 1$ is even. **1**

Even $f(-x) = f(x)$ $f(-x) = |-x| - 1$

$= |x| - 1$

$\therefore$ even function $= f(x)$

(b) Sketch the graph of the curve $f(x) = |x| - 1$ showing the intercepts on the axes. **2**



Question 27 (4 marks)

$y = 8(3x-1)^{-1}$

(a) Find the equation of the tangent to the curve $y = \frac{8}{3x-1}$ at the point where $x = 1$. **3**

$\frac{dy}{dx} = \frac{(3x-1) \times 0 - 8 \times 3}{(3x-1)^2}$ $\quad \frac{dy}{dx} = -8 \times 3x(3x-1)^{-2}$

$= \frac{-24}{(3x-1)^2}$ $\quad = \frac{-24}{(3x-1)^2}$

$f'(1) = \frac{-24}{4} = \frac{-24}{4} = -6$

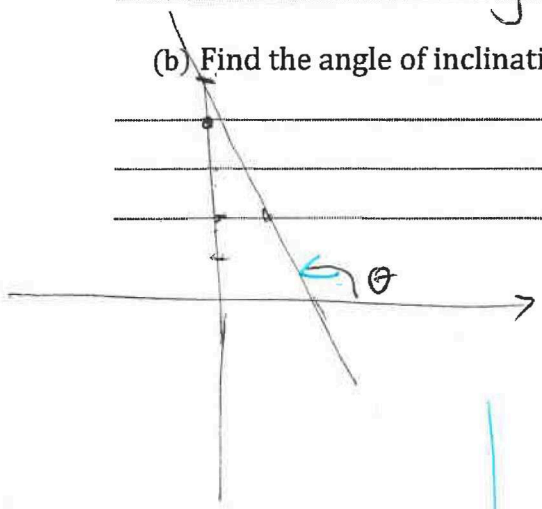
$x = 1 \quad y = \frac{8}{3-1} = \frac{8}{2} = 4 \quad (1, 4)$

$y - 4 = -6(x-1)$

$y - 4 = -6x + 6$

$y = -6x + 10$ $\quad y = -6x + 10$

(b) Find the angle of inclination of this tangent correct to the nearest degree. **1**

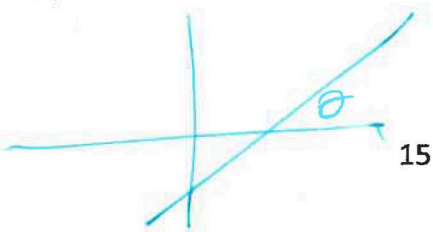


$\tan\theta = \frac{-6}{1} = -80 + 180°$

$\theta = 99.46$

$\theta = 99°$

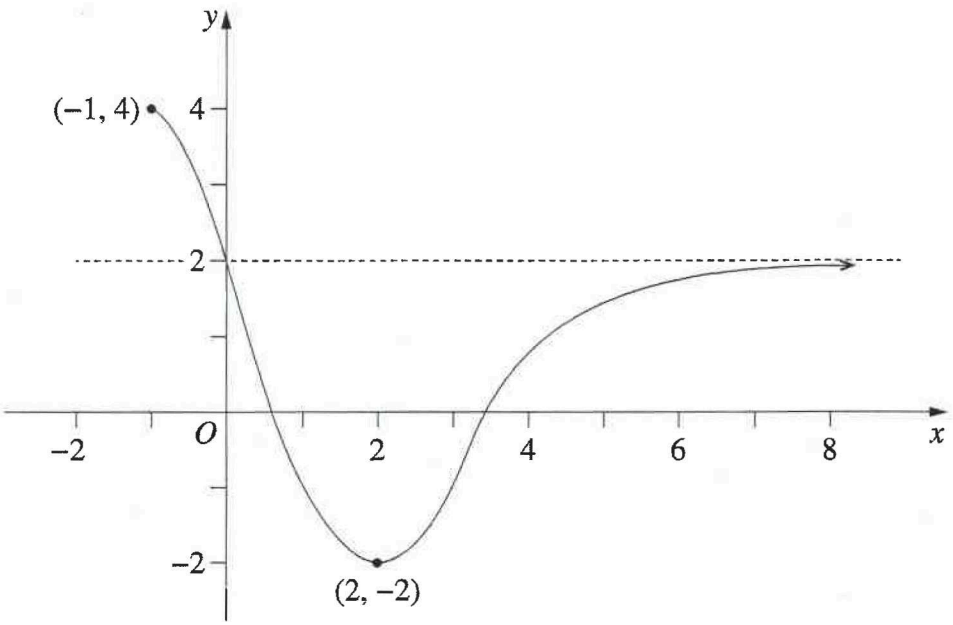
$\tan\theta = \frac{O}{A} = \frac{\text{rise}}{\text{run}} = \text{gradient}$



Question 28 (2 marks)

2

The graph of a function $f(x)$ is shown. It has an asymptote at $y = 2$.



State the domain and range of $f(x)$

$D: x \geq -1$

$R: -2 \leq y \leq 4$

Question 29 (4 marks)

For a certain brand of medicine, the amount M present in the blood after t hours is given by $M = 3t^2 - t^3$, for $0 \leq t \leq 3$

(a) Find the average rate of change between $t = 0$ and $t = 3$

$f(3) = 27 - 27 = 0$

$f(0) = 0$

$$\text{Average rate of change} = \frac{f(3) - f(0)}{3 - 0}$$

$$= \frac{0}{3}$$

$$= 0$$

(b) Find the instantaneous rate of change $\frac{dM}{dt}$ at $t = 1$ **2**

$$\frac{dm}{dt} = 6t - 3t^2$$

$$f'(1) = 6 - 3 = 3$$

Question 30 (2 marks)

2

Solve for x $\log_2(x+1) + \log_2(x-1) = 3$.

$$\log_2(x^2 - 1) = 3$$

$$2^3 = x^2 - 1$$

$$8 + 1 = x^2$$

$$x^2 = 9 \quad x > 1$$

$$x = +3$$

45 mins

Question 31 (3 marks)

The energy, E Megajoules, radiated by an earthquake is given by the formula $E = k \times 10^{1.5M}$ where M is the magnitude of the earthquake on the Richter scale And k is a constant. An earthquake of magnitude 1 radiates 2 Megajoules of energy.

(a) Show that $log_{10}E = log_{10}2 + 1.5(M - 1)$. **2**

$E = k\,10^{1.5M}$

$\frac{E}{k} = 10^{1.5M}$

$\log_{10}\frac{E}{k} = 1.5M$

$M = \frac{1}{1.5}\log_{10}\frac{E}{k}$

$M = \frac{1}{1.5}(\log_{10}E - \log_{10}k)$

$1.5M = \log_{10}E - \log_{10}\frac{2}{10^{1.5}}$

$= \log_{10}E - (\log_{10}2 - \log 10^{1.5})$

$1.5M = \log_{10}E - \log_{10}2 + \log_{10}10^{1.5}$

$M = 1 \quad E = 2$

$2 = k \times 10^{1.5}$

$k = \frac{2}{10^{1.5}} = 0.06$

add lines

(b) Find the magnitude of an earthquake which radiates 2×10^6 Megajoules of energy. **1**

$\log_{10}E = \log_{10}2 + 1.5M - 1.5$

$\log_{10}(2 \times 10^6) = \log_{10}2 + 1.5M - 1.5$

$6 = 1.5M$

$M = 4$

End of paper

$\log_{10}E = \log_{10}2 + 1.5M - 1.5$

$\log_{10}E = \log_{10}2 + 1.5(M-1)$

Section II extra writing space

If you use this space, clearly indicate which question you are answering.

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Student Number: _____

Preliminary Mathematics Advanced

Yearly Examination
September 2020

Section I

Multiple-Choice Answer Sheet
Circle the answer of your choice.

1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D

Section II extra writing space

If you use this space, clearly indicate which question you are answering.