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Name:

Teacher:.....



Pymble Ladies' College

MATHEMATICS EXTENSION 1

HSC ASSESSMENT

TASK 1

Term 4
2021

Time Allowed: 55 minutes

General Instructions

- Write using black or blue pen.
- Erasable pens are **not** to be used.
- Answer the Multiple Choice questions using the Answer sheet provided.
- Answer Questions 9-12 in the Answer Booklet provided.
- Approved calculators may be used.
- Diagrams are not drawn to scale.
- All necessary working should be shown in every question.
- Marks may be deducted for careless or untidy work.
- A reference sheet is provided.

Mark	/32
Rank	/
Highest Mark	/32

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Section I

Multiple Choice. (8 marks)

Use Multiple Choice Answer Sheet for Questions 1 - 8.

1 Which of the following is NOT a polynomial?

(A) $\sqrt{5}x - x^3 + 2x$

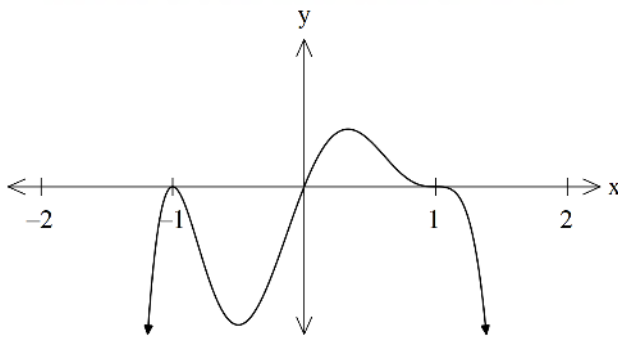
(B) $\left(x^2 + \frac{x}{2} - 1\right)$

(C) $\frac{x-1}{2}$

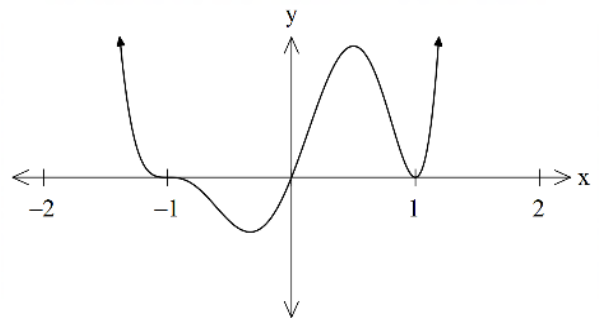
(D) $2x^4 + 3x^{-2}$

2 Which diagram best represents the graph $y = x(1-x)^3(x+1)^2$?

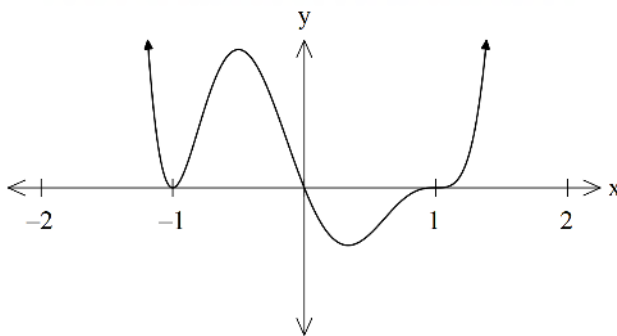
(A)



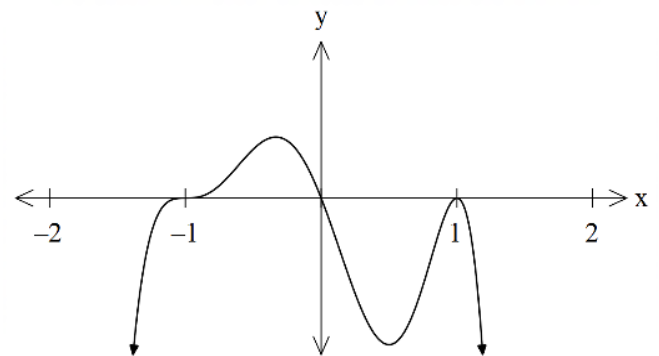
(B)



(C)



(D)



3 Which polynomial has a multiple root at $x = 2$?

(A) $x^3 + x - 6$

(B) $x^3 + 2x^2 - 4x - 8$

(C) $x^3 - 3x^2 + 4$

(D) $2x^2 - 8$

- 4 How many numbers greater than 6000 can be formed from the digits 1, 4, 5, 7, 8 if no digit is repeated?
- (A) 48
(B) 120
(C) 168
(D) 2880
- 5 Given that α and β are the roots of the equation $x^2 - 3x + c = 0$ and $\alpha^2 + \beta^2 = 7$, what is the value of c ?
- (A) -1
(B) 0
(C) 1
(D) 2
- 6 How many ways can 8 people be chosen from a group of 20 people and then arranged in a circle?
- (A) ${}^{20}P_8 \times 8!$
(B) ${}^{20}P_8 \times 7!$
(C) ${}^{20}C_8 \times 8!$
(D) ${}^{20}C_8 \times 7!$
- 7 Which of the following is the simplified expression of $n(n-1)! - (n+1)n!$?
- (A) $(n^2)!$
(B) $-nn!$
(C) $(n^2 - 1)!$
(D) $(n+1)!(n-1)$
- 8 A tennis team of four players is to be selected from ten students. If the players are chosen at random, what is the probability that Cameron will be selected but Maria will not?
- (A) $\frac{1}{3}$
(B) $\frac{2}{3}$
(C) $\frac{3}{5}$
(D) $\frac{4}{15}$

Section II

Answer each Question in the Answer Booklet provided.

Question 9 (7 marks)

- (a) In how many distinct ways can the 10 letters of BOOKKEEPER be arranged in a line? **2**
- (b) Let $P(x) = 4x^3 - 27x^2 + 54x - 27$.
- (i) Show that $(x - 3)$ is a factor of $P(x)$. **1**
- (ii) Show by long division that $P(x) = (4x - 3)(x - 3)^2$ when fully factorised. **2**
- (iii) Hence, solve $4x^3 - 27x^2 + 54x - 27 > 0$. **2**

Question 10 (7 marks)

- (a) (i) Expand and simplify $(1 + 2x)^4$. **1**
- (ii) Hence, find the values of a and b if $(1 + 2\sqrt{3})^4 \equiv a + b\sqrt{3}$. **1**
- (b) Two adults and five children go to the movies. They are allocated seven adjacent seats in a single row. In how many ways can the group be seated if
- (i) the adults sit next to each other? **1**
- (ii) the adults do NOT sit together? **1**
- (c) Consider the polynomial $P(x) = x^3 + ax^2 + bx - 7$. **3**
- When $P(x)$ is divided by $x + 1$ the remainder is -3 and when $P(x)$ is divided by $x - 3$ the remainder is 5 . What are the values of a and b ?

Question 11 (6 marks)

- (a) A box contains 10 horror, 20 romantic comedy, 8 drama, 15 crime and 25 sci-fi movie DVD's. How many DVD's do I need to choose, to ensure that I have 14 movies of the same genre (style)? 2
- (b) If α , β and γ are roots of the equation $3x^3 - 8x^2 - 1 = 0$, what is the value of $(\alpha + 1)(\beta + 1)(\gamma + 1)$? 2
- (c) Find the term independent of x in the expansion of $\left(2x - \frac{3}{x}\right)^{14}$. 2

Question 12 (5 marks)

- (a) A committee of seven people is formed from 15 teachers and 4 students. How many different committees can be made if both teachers and students are represented and there are more teachers than students? 2
- (b) (i) Show that $\binom{n-1}{2} + \binom{n-1}{3} = \binom{n}{3}$. 2
- (ii) Find the value of $\binom{n}{3}$ given that $\binom{n-1}{3} = 210$ and $\binom{n-1}{2} = 120$.

1

End of Task