

Name: \_\_\_\_\_

**Part A:** Place the letter of the correct response in the space provide (12 marks).1. What is the remainder when  $x^3 - 3x^2 + 5$  is divided by  $(x + 2)$ ?

(A) -15

(B) -13

(C) 1

(D) 25

1. A2. What is the degree of the polynomial  $(x) = x(x - 5)^2(x + 3)$ ?

(A) 2

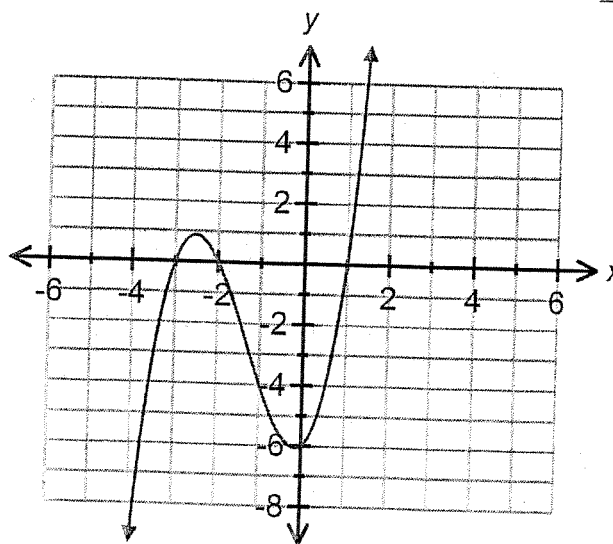
(B) 3

(C) 4

(D) 5

2. C3. If  $(x - 3)$  is a factor of  $2x^3 + kx^2 - 20x - 45$ , what is the value of  $k$ ?(A)  $-\frac{17}{3}$ (B)  $-\frac{13}{3}$ (C)  $\frac{13}{3}$ (D)  $\frac{17}{3}$ 3. D

4. Which interval describes where the function is positive?

(A)  $x < -3$  and  $-2 < x < 1$ (B)  $x \leq -3$  and  $-2 \leq x \leq 1$ (C)  $-3 < x < -2$  and  $x > 1$ (D)  $-3 \leq x \leq -2$  and  $x \geq 1$ 4. C

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5. What is the end behavior of the polynomial  $P(x) = -2x^4 + 4x^3 - 2x + 3$ ?

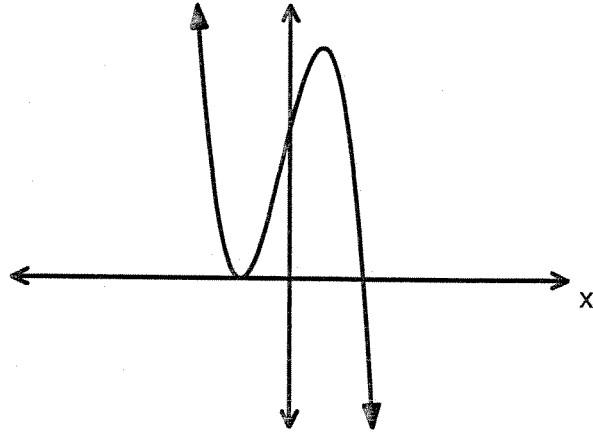
5. B

- (A) Quadrant I to Quadrant II
- (B) Quadrant III to Quadrant IV
- (C) Quadrant I to Quadrant III
- (D) Quadrant II to Quadrant IV

6. The graph of a third degree polynomial function of the form  $P(x) = ax^3 + bx^2 + cx + d$  is shown. Which statement about the values of  $a$  and  $d$  is correct?

6. C

- (A)  $a > 0$  and  $d > 0$
- (B)  $a > 0$  and  $d < 0$
- (C)  $a < 0$  and  $d > 0$
- (D)  $a < 0$  and  $d < 0$



7. Which polynomial function has zeros of -2, 1 (multiplicity 2), 3 and  $y$ -intercept = -6?

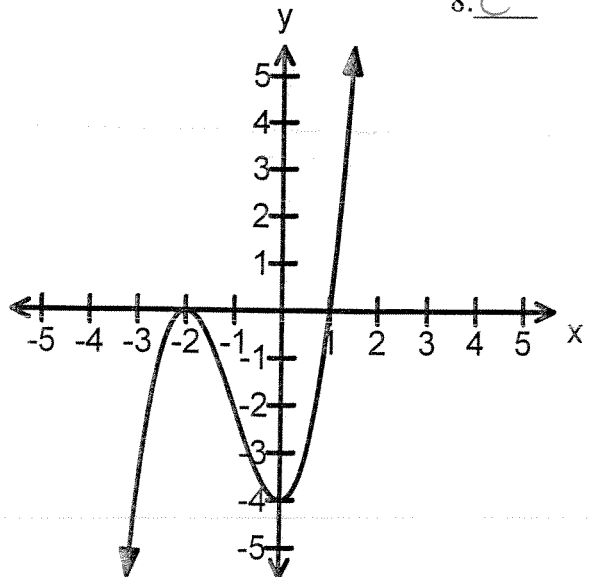
7. B

- (A)  $P(x) = -(x+2)(x-1)^2(x-3)$
- (B)  $P(x) = (x+2)(x-1)^2(x-3)$
- (C)  $P(x) = \frac{1}{2}(x-2)^2(x+1)(x+3)$
- (D)  $P(x) = -\frac{1}{2}(x-2)^2(x+1)(x+3)$

8. Which function represents the graph?

8. C

- (A)  $P(x) = (x-2)^2(x+1)$
- (B)  $P(x) = -(x-2)^2(x+1)$
- (C)  $P(x) = (x+2)^2(x-1)$
- (D)  $P(x) = -(x+2)^2(x-1)$



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9. When a polynomial  $P(x)$  is divided by  $x - 2$ , the quotient is  $x^2 + 4x - 7$  and the remainder is  $-4$ . What is the polynomial? 9. D

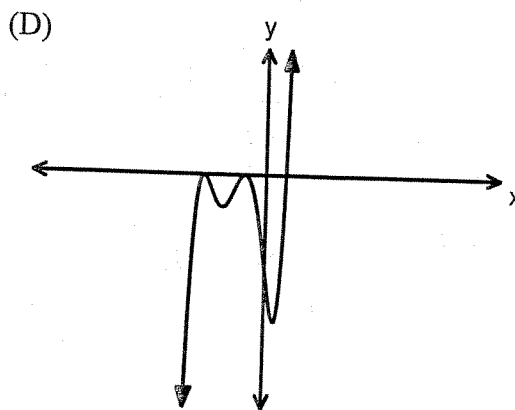
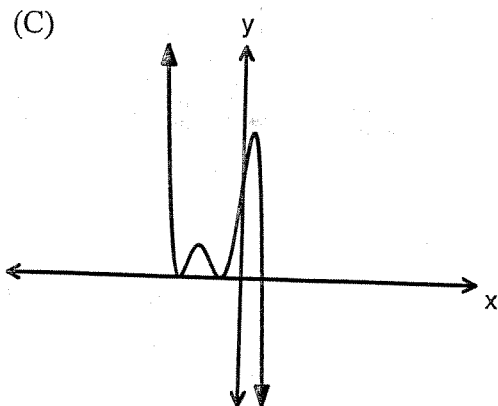
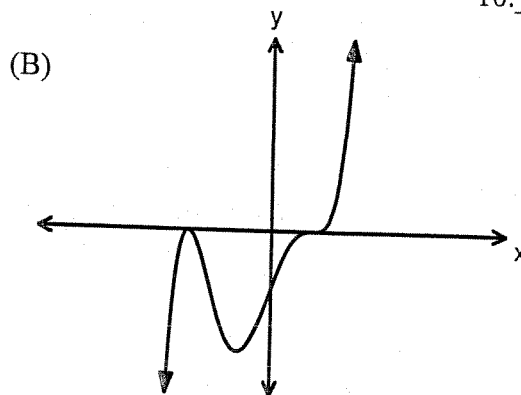
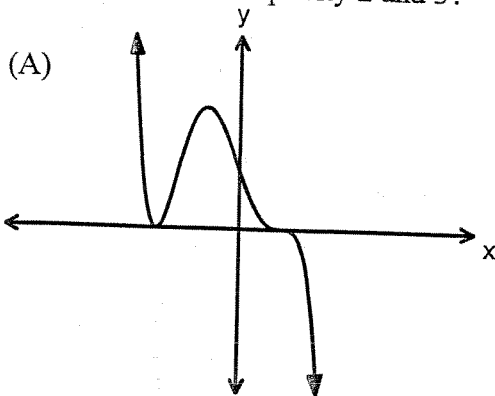
(A)  $P(x) = x^3 + 2x^2 - 15x - 18$

(B)  $P(x) = x^3 - 2x^2 + x + 10$

(C)  $P(x) = x^3 - 2x^2 - x - 18$

(D)  $P(x) = x^3 + 2x^2 - 15x + 10$

10. Which graph represents a quintic polynomial function with a negative leading coefficient and zeros with multiplicity 2 and 3? 10. A



11. What is the remainder when  $P(x) = -2x^{81} + 3$  is divided by  $(x - 1)$ ? 11. A

(A) 1

(B) 0

(C) 3

(D) 5

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12. Which represents  $x^3 + 2x^2 - 9x - 18$  when it is completely factored?

12. C

(A)  $(x^2 - 9)(x + 2)$

(B)  $(x - 3)(x - 3)(x + 2)$

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

(D)  $(x^2 + 9)(x - 2)$

**Part B: Constructed Response:** Show workings to all problems.

13. Determine the zeros and sketch the graph for the polynomial  $P(x) = 3x^3 - 5x^2 - 26x - 8$ .  
(6 marks)

*graph - 8*

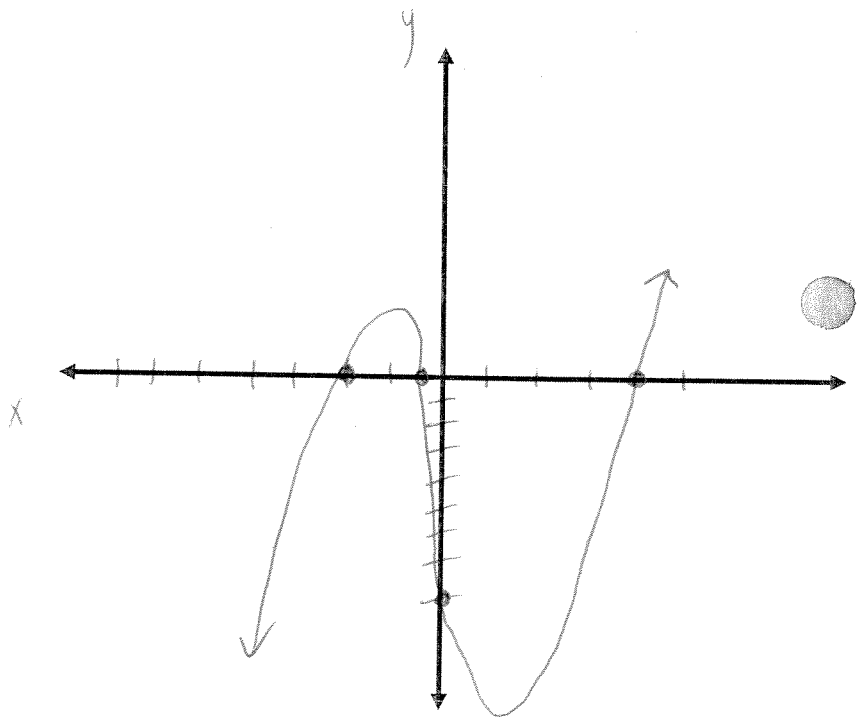
$P(-2) = 0 \therefore x + 2$  is a factor

$$\begin{array}{r} -2 \overline{) 3 \quad -5 \quad -26 \quad -8} \\ \underline{-6 \quad 22 \quad 8} \\ 3 \quad -11 \quad -4 \quad \text{OR} \end{array}$$

$3x^2 - 11x - 4 = 0$

$(3x + 1)(x - 4) = 0$

$x = -1/3$  or  $x = 4$



Factors:

$(x + 2)(3x + 1)(x - 4)$

Zeros:

$-2, -1/3, 4$

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14. Determine the equation of the function in factored form. Don't forget to find 'a'.

(4)

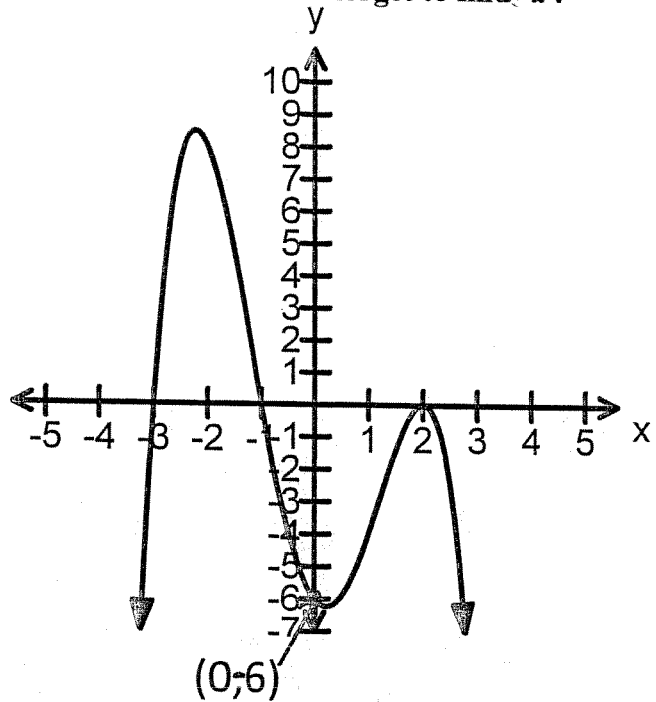
$$y = a(x-2)^2(x+1)(x+3)$$

$$-6 = a(0-2)^2(0+1)(0+3)$$

$$-6 = 12a$$

$$a = -\frac{1}{2}$$

$$y = -\frac{1}{2}(x-2)^2(x+1)(x+3)$$



15. When  $x^3 - 2kx^2 + 3k^2x - 15$  is divided by  $x - 2$ , the remainder is 1. Determine the value(s) for  $k$ . (3 marks)

$$2^3 - 2k(2)^2 + 3(k^2)(2) - 15 = 1$$

$$8 - 8k + 6k^2 - 15 - 1 = 0$$

$$6k^2 - 8k - 8 = 0$$

$$2(3k^2 - 4k - 4) = 0$$

$$2(3k+2)(k-2) = 0$$

$$k = -\frac{2}{3} \text{ or } k = 2$$

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16. A toothpaste box has square ends. The length of the box is 12 cm greater than the width. The volume is 135 cm<sup>3</sup>. What are the dimensions of the box? (4)

$$(x)(x)(x+12) = 135$$

$x$  - represents width of box

$$x^2(x+12) = 135$$

$$x^3 + 12x^2 - 135 = 0$$

$$P(3) = 3^3 + 12(3)^2 - 135 = 0$$

3	1	12	0	-135
		3	45	135
	1	15	45	0R

$$x^2 + 15x + 45$$

$$x = \frac{-15 \pm \sqrt{15^2 - 4(1)(45)}}{2(1)}$$

→ no real solution

The dimensions are 3cm x 3cm x 15cm.