

Part A) Knowledge and Understanding

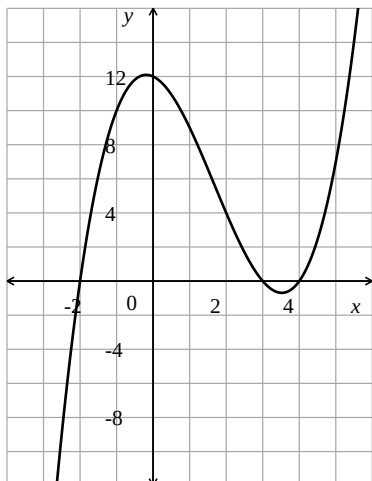
Multiple Choice

Identify the choice that best completes the statement or answers the question.

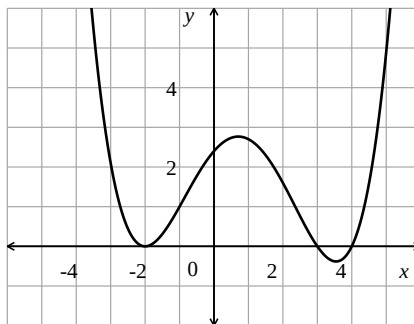
- If $x^3 - 4x^2 + 5x - 6$ is divided by $x - 1$, then the restriction on x is
 - $x \neq -4$
 - $x \neq -1$
 - $x \neq 1$
 - no restrictions
- What is the remainder when $x^4 + 2x^2 - 3x + 7$ is divided by $x + 2$?
 - 25
 - 13
 - 9
 - 37
- Which of the following binomials is a factor of $8x^3 - 4x^2 - 2x + 1$?
 - $x - 1$
 - $x + 2$
 - $2x + 1$
 - $5x + 1$
- Which set of values for x should be tested to determine the possible zeros of $x^3 - 2x^2 + 3x - 12$?
 - 1, 2, 3, 4, 6, and 12
 - $\pm 1, \pm 2, \pm 3, \pm 4, \pm 6$, and ± 12
 - $\pm 1, \pm 2, \pm 3, \pm 4$, and ± 6
 - $\pm 2, \pm 3, \pm 4, \pm 6$, and ± 12
- What is the remainder when $x^2 + 3x$ is divided by x ?
 - 0
 - 3
 - 4
 - you cannot divide by x
- Which of the following is the fully factored form of $x^3 + 3x^2 - x - 3$?
 - $(x + 3)(x^2 - 1)$
 - $(x - 1)(x + 1)(x + 3)$
 - $x^2(x + 3) - (x + 3)$
 - $(x^2 - 1)(x - 3)$
- A family of polynomials has equation $y = k(x - 4)(x + 1)^2$. What is an equation for the family member whose graph passes through the point (2, -54)?
 - $y = 3(x - 4)(x + 1)^2$
 - $y = -3(x - 4)(x + 1)^2$
 - $y = (1/70\,225)(x - 4)(x + 1)^2$
 - none of the above

8. Which of the following graphs of polynomial functions corresponds to a cubic polynomial equation with roots -2, 3, and 4?

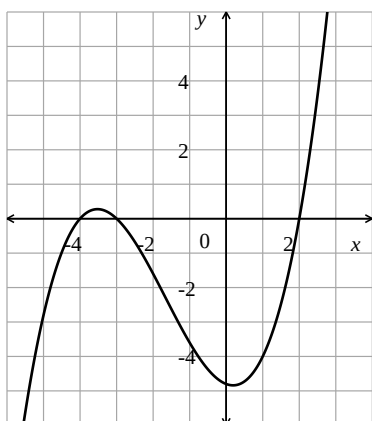
a.



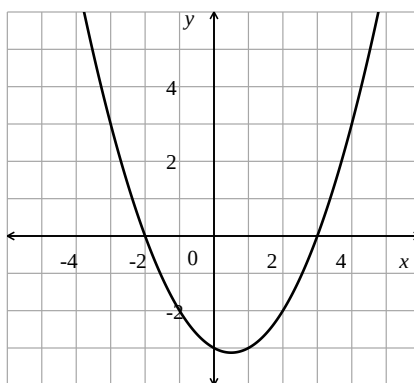
c.



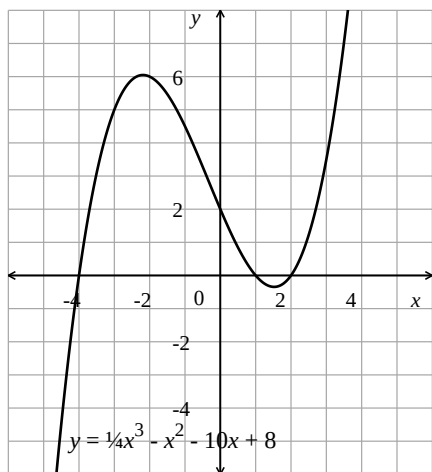
b.



d.



9. A graph of $y = \frac{1}{4}x^3 + x^2 - 10x + 8$ is shown. Use the graph to solve $x^3 + 4x^2 - 40x + 32 < 0$.



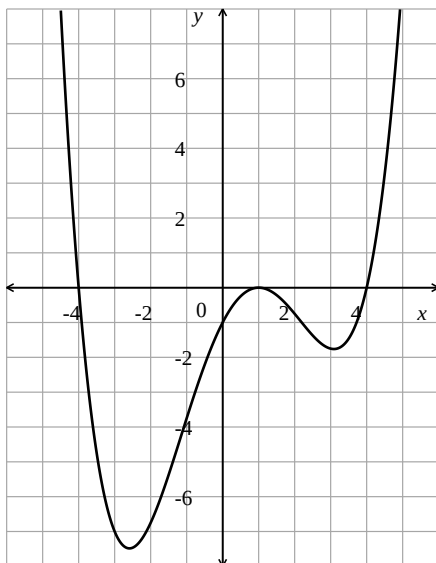
a. $x < -4$

b. $x < -4, 1 < x < 2$

c. $-4 < x < 1, x > 3$

d. $x < -4, 1 < x > 2$

10. What is an equation for the quartic function represented by this graph?



a. $y = (1/16)(x - 4)(x + 1)^2(x + 4)$

c. $y = 16(x - 4)(x + 1)^2(x + 4)$

b. $y = (1/16)(x - 4)(x - 1)^2(x + 4)$

d. $y = 16(x - 4)(x - 1)^2(x + 4)$

Short Answer

1. Use long division to divide:

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$$5x^4 - 7x^3 - 12x^2 - 1 \quad \text{by} \quad x^2 - x + 2$$

2. Divide $3x^3 - 2x^2 - 8$ by $x + 2$ using synthetic division and then write a division statement.

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Part B) Applications

1. Using all known factoring skills, fully factor the following.

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a) $27x^3 + \frac{1}{8}y^6$

b) $2x^4 + 7x^3 - 10x^2 - 32x$

2. Solve the following polynomial equations. Exact answers only.

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a) $2x^3 + x^2 - 10x - 5 = 0$

b) $6x^3 + x^2 - 31x = -10$

3. Solve the following polynomial inequalities using each method once, making sure to show all work.

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a) $-3(x - 2)(x + 4)(x - 5) \leq 0$

b) $x^3 \geq 9x$

4. For a family of cubic functions that have zeros of -2 and $4 \pm \sqrt{3}$

a) State the simplified general equation for any member of this family.

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b) State the specific equation for the member of this family that has a point of $(1, 24)$ on the graph.

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Part C) Communication

For # 1 - 3 complete each statement.

/3

1. If $P(-b/a) = 0$ for a polynomial $P(x)$, then $ax + b$ is a _____ of $P(x)$.
2. Polynomial functions with the same zeros are said to belong to the same _____.
3. If solving $P(x) \leq 0$ by using intervals and $P(x)$ has n number of zeros, then the number of intervals to be tested is _____.

Part D) Thinking, Inquiry and Problem Solving

Find any solutions that satisfy **both**: $x^3 + x^2 - 20x \leq 0$ and $x^4 - 9x^2 < 0$

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