1. Long Division

$(5x^4 - 2x^3 - 7x^2 - 39) \div (x^2 + 2x - 4)$

Answer: $5x^2 - 12x + 37 + \frac{-122x + 109}{x^2 + 2x - 4}$

2. Synthetic Division

$(x^4 + 4x^3 + 16x - 35) \div (x + 5)$

Answer: $x^3 - x^2 + 5x - 9 + \frac{10}{x + 5}$

3. Binomial Expansion

Use Pascal's Triangle to find the 4th term of $(2q - 3)^4$

Answer: $-216q$

4. a. Create an equation in factored form if the polynomial has the following solutions.

$x = 2,\ 2 + \sqrt{5},\ -i$

b. Multiplying polynomials
$(5x^2 - 4x + 6)(-2x + 3)$

Answers:

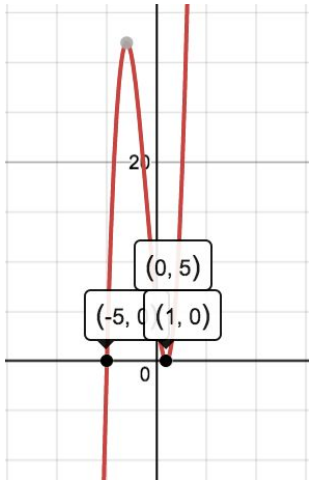
a.
$f(x) = (x-2)(x-2-\sqrt{5})(x-2+\sqrt{5})(x-i)(x+i)$

B. $-10x^3 + 23x^2 - 24x + 18$

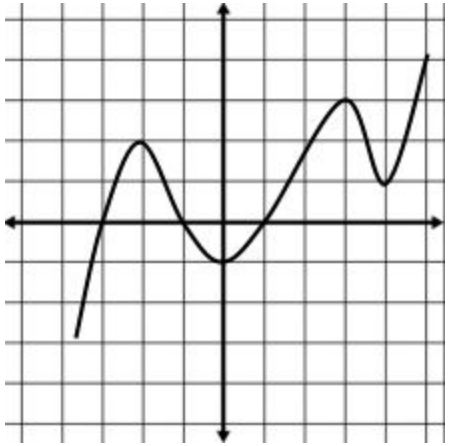
5. Show a term is a factor, factor completely and sketch

Show that $(x + 5)$ is a factor of $f(x) = x^3 + 3x^2 - 9x + 5$. Then, factor completely and sketch a graph. Label the x and y intercepts on the graph

Answer: $f(x) = (x-1)(x-1)(x+5)$



6. Characteristics of the graph



a. Local Mins/Maxs
b. End behavior
c. f(x) > 0 / f(x) < 0
d. increasing/decreasing

Answers:
A. Local min: (0, -1), (4, 1) Local max: (-2, 2) (3, 3)
B. $f(x) \to +\infty \text{ as } x \to +\infty,\ f(x) \to -\infty \text{ as } x \to -\infty$
C. $f(x) > 0 \text{ when } -3 < x < -1,\ x > 1$
$f(x) < 0 \text{ when } x < -3,\ -1 < x < 1$
D. increasing $x < -2,\ 0 < x < 3,\ x > 4$
Decreasing $-2 < x < 0,\ 3 < x < 4$

7. Solve (imaginary solutions) $f(x) = x^3 + x^2 + 3x + 3$ **Answer:** $x = -1, \pm i\sqrt{3}$	8. Transformations Consider the function $f(x) = x^3$ Write a new function $g(x)$ after the following transformation in the order that they are listed! 1. Translation left 3 and down 2 2. Reflection over the x-axis 3. Vertical stretch by 5 **Answer:** $g(x) = -5(x + 3)^3 + 10$	9. Factoring $-4x^8 + 256x^5$ **Answer:** $-4x^5(x - 4)(x^2 + 4x + 16)$

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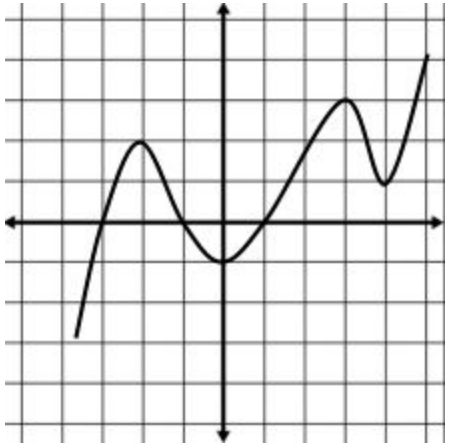

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8. Transformations

Consider the function $f(x) = x^3$
Write a new function $g(x)$ after the following transformation in the order that they are listed!

1. Translation left 3 and down 2
2. Reflection over the x-axis
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9. Factoring

$-4x^8 + 256x^5$