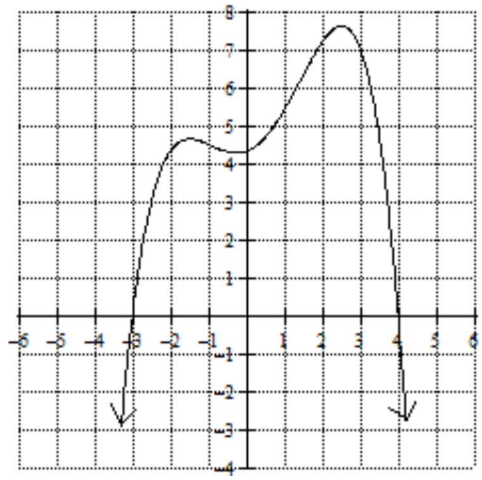
# Homework 4.1

Given the graph of the function $h(x)$, a polynomial function of least degree, pictured to the right, answer questions 1 – 2.




1. What type of function is $h(x)$? Give a reason for your answer.

   If the graph of $h(x)$ were shifted down, the maximum number of zeros is 4. By FTA, $h(x)$ is likely quartic.

2. What is the combination of positive, negative, imaginary and zero roots of $h(x)$? Give a reason for your answer.

   1 negative root → $x = -3$ } each multiplicity
   1 positive root → $x = 4$ } of 1.

   The two remaining roots are imaginary.

Answer questions 3 – 9 about the function $f(x) = 6x^4 - x^3 - 34x^2 + 19x + 10$.

3. How many sign changes are in the equation of $f(x)$?

   $f(x) = \underbrace{6x^4 - x^3}_{1} \underbrace{-34x^2 + 19x}_{2} + 10$

   2 SIGN CHANGES

4. How many positive roots is/are possible for $f(x)$?

   $f(x)$ has 2 or 0 positive roots

5. Find an equation for $f(-x)$. How many sign changes are in the equation of $f(-x)$?

   $f(-x) = 6x^4 \underbrace{+ x^3 - 34x^2}_{1} \underbrace{-19x + 10}_{2}$

   2 SIGN CHANGES

6. How many negative roots is/are possible for $f(x)$?

   $f(x)$ has 2 or 0 NEGATIVE roots

7. Is zero a possible root of $f(x)$? If so, how many times is zero a root? Give a reason why or why not.

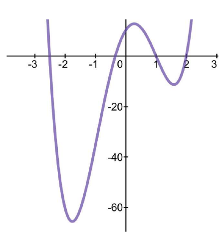
   Since $f(x)$ has a constant term, $x^n$ is not a factor.

   ∴ $x = 0$ is not a possible root.

8. Create a table displaying the all of the possible combinations of positive, negative, imaginary and zero roots of $f(x)$.

| P | N | Zero | i |
|---|---|---|---|
| 2 | 2 | 0 | 0 |
| 2 | 0 | 0 | 2 |
| 0 | 2 | 0 | 2 |
| 0 | 0 | 0 | 4 |

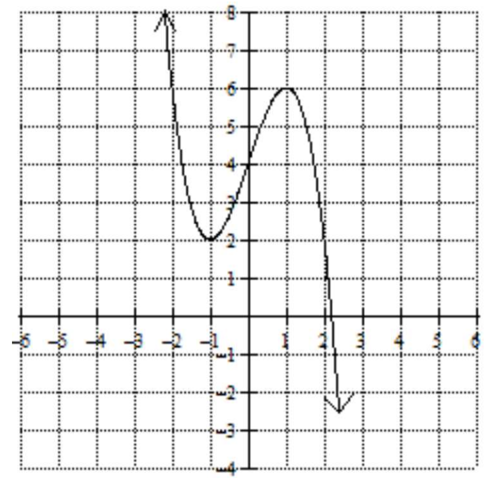
9. Using a graphing calculator, sketch a graph of $f(x)$. Then, based on the graph, which combination from your table in exercise 8 is the correct combination. Give a reason for your answer.




| P | N | Zero | i |
|---|---|---|---|
| 2 | 2 | 0 | 0 |

is the correct combo because $f(x)$ crosses the negative x-axis twice and crosses the positive x-axis twice.

Given the graph of the function $g(x)$, a polynomial function of least degree, pictured to the right, answer questions 10 – 11.




10. What type of function is $g(x)$? Give a reason for your answer.

If $g(x)$ were shifted down, it could cross the x-axis 3 times.

By the FTA, $g(x)$ is likely cubic.

11. What is the combination of positive, negative, imaginary and zero roots of $g(x)$? Give a reason for your answer.

By FTA, since $g(x)$ is likely cubic, it has 3 roots.

The graph of $g(x)$ shows 1 positive, 0 negative, 0 zero roots.

The two remaining roots must be imaginary.

12. Given the function below, create a chart of all of the possible numbers of positive, negative, imaginary and zero roots of the function. Show your analysis. 1

$$p(x) = 2x^3 + 7x^2 + 2x - 3$$

$$p(-x) = -2x^3 + 7x^2 - 2x - 3$$

2

| 1<br>P | 2 or 0<br>N | 0<br>Zero | 2 or 0<br>i |
|---|---|---|---|
| 1 | 2 | 0 | 0 |
| 1 | 0 | 0 | 2 |

14. Given the function below, create a chart of all of the possible numbers of positive, negative, imaginary and zero roots of the function. Show your analysis. 1

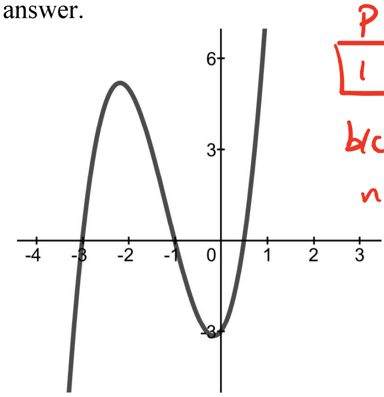
$$g(x) = x^4 + 2x^3 - 3x^2$$

$$g(-x) = x^4 - 2x^3 - 3x^2$$

1

| 1<br>P | 1<br>N | 2<br>Z | 4, 2 or 0<br>i |
|---|---|---|---|
| 1 | 1 | 2 | 0 |

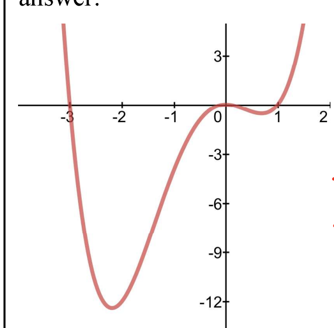
13. Using a graphing calculator, sketch a graph of $p(x)$. Then, based on the graph, which combination from your table in exercise 12 is the correct combination. Give a reason for your answer.




| P | N | Zero | i |
|---|---|---|---|
| 1 | 2 | 0 | 0 |

b/c $p(x)$ crosses the negative x-axis twice and the positive x-axis once.

15. Using a graphing calculator, sketch a graph of $g(x)$. Then, based on the graph, which combination from your table in exercise 14 is the correct combination. Give a reason for your answer.




| P | N | Zero | i |
|---|---|---|---|
| 1 | 1 | 2 | 0 |

b/c the graph of $g(x)$ crosses the negative and positive x-axis once and is tangent to the x-axis at $x=0$.