

LESSON #9: THE REMAINDER THEOREM & FINDING A REMAINDER ON A GRAPH

Do Now: Consider the polynomial function $g(x) = x^3 - 3x^2 + 6x + 8$.

a. Divide g by $x + 1$.

b. Find $g(-1)$.

The remainder found after dividing P by $x - a$ will be the same value as $P(a)$

If $p(a) = 0$, then $(x - a)$ is a factor

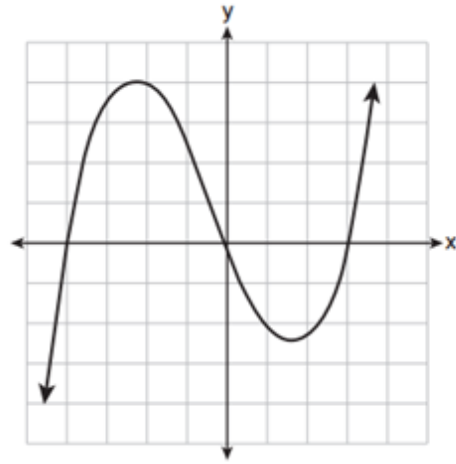
What do we suspect about the connection between the remainder from dividing a polynomial P by $x - a$ and the value of $P(a)$?

1) Consider the polynomial: $P(x) = x^4 + 3x^3 - 28x^2 - 36x + 144$. Is $x + 3$ one of the factors of P ?

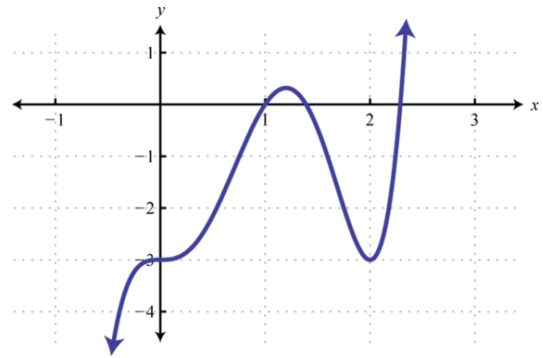
2) When $x^3 + kx^2 - 4x + 2$ is divided by $x + 2$, the remainder is 26. Find k .

3) The graph of $p(x)$ is shown in the accompanying diagram. What is the remainder when $p(x)$ is divided by $x + 4$?

- 1) $x - 4$
- 2) -4
- 3) 0
- 4) 4



4) The graph of a polynomial function is illustrated below. What is the remainder when $p(x)$ is divided by $(x - 2)$?



5) Consider the polynomial function: $P(x) = x^3 - 8x^2 - 29x + 180$. If $P(9) = 0$, find the remaining two factors of P .

6) If $p(a)$ is the remainder when $x^3 + 3x^2 - 18x - 40$ is divided by $x - a$, for which value of a would $p(a) = 0$?

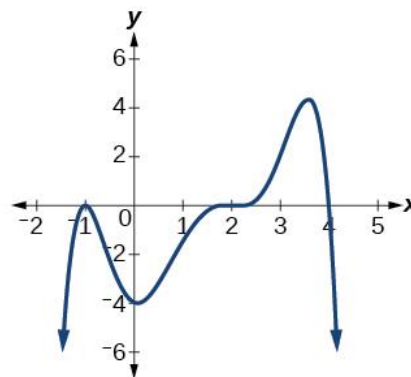
- (A) 2
- (B) -2
- (C) 3
- (D) -3

Practice:

7) Use the Remainder Theorem to find the remainder for the following division.

$$(k^3 - k^2 - k - 2) \div (k - 2)$$

8) The graph of a polynomial function, $M(x)$, is illustrated below. What is the remainder when $M(x)$ is divided by $x+1$?



9) Find a such that $2x+5$ will be a factor of $4x^3 + 8x^2 + ax + 30$.

10) Determine if $x - 5$ is a factor of $2x^3 - 4x^2 - 7x - 10$. Explain your answer.

LAB #8

- 1) Use the Remainder Theorem to find the remainder for the following division.

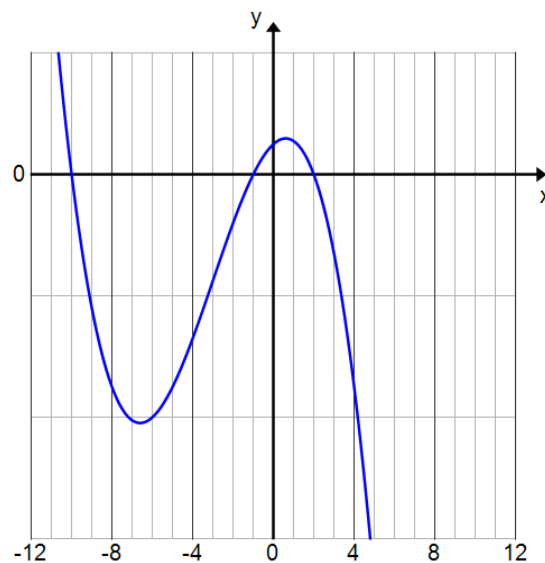
$$(x^2 - 4x + 1) \div (x - 3)$$

- 2) Is $x - 5$ a factor of the function $f(x) = x^3 + x^2 - 27x - 15$? Explain your answer.
- 3) Is $x + 1$ a factor of the function $f(x) = 2x^5 - 4x^4 + 9x^3 - x + 13$? Explain your answer.
- 4) Write a polynomial function, $p(x)$ in standard form, whose zeros are -1 , 2 , and 7 .

- 5) The graph to the right is of a third degree polynomial function f .

a. State the zeros of f .

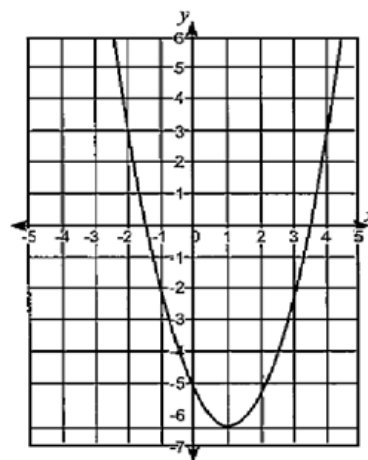
b. Write a formula (equation) for f in factored form using c for the constant.



6) Find the value of k so that $(x^3 - kx^2 + 2) \div (x - 1)$ has remainder 8.

7) The graph of the quadratic function, $f(x)$, is shown below. What is the remainder when $f(x)$ is divided by $x - 2$?

- a. -5
- b. 3
- c. -3
- d. 5



8) Find the roots of $x^2 - 6x + 1 = 0$ in simplest radical form.

9) Use your calculator to answer this question!

The expression $\frac{4x^3 + 5x + 10}{2x + 3}$ is equivalent to

(1) $2x^2 + 3x - 7 + \frac{31}{2x + 3}$ (3) $2x^2 + 2.5x + 5 + \frac{15}{2x + 3}$

(2) $2x^2 - 3x + 7 - \frac{11}{2x + 3}$ (4) $2x^2 - 2.5x - 5 - \frac{20}{2x + 3}$