POLYNOMIALS

1. According to the Rational Root Theorem, list all possible rational roots of $3x^2 + 2x + 7 = 0$.

    (handwritten: $\pm\frac{7}{3} \;\pm\frac{1}{3}\; \pm 7 \;\pm 1$)

    (handwritten: $\pm 1 \quad \pm 1$)
    (handwritten: $\pm 3 \quad \pm 7$)

    A. $\pm 1, \ \pm 3$

    B. $\pm 1, \ \pm 7$

    (handwritten: factors of 7 $\pm 1, \pm 7$)
    (handwritten: " " 1 $\pm 1, \pm 3$)

    C. $\pm 1, \ \pm 3, \ \pm\frac{1}{7}, \ \pm\frac{3}{7}$

   (D) $\pm 1, \ \pm 7, \ \pm\frac{1}{3}, \ \pm\frac{7}{3}$

    (handwritten: $+2 \quad -3$)
    (handwritten: $\rightarrow (x-2)(x+3)$)

2. Which sketch best represents the graph of $y = (2-x)(x+3)$?

    A.
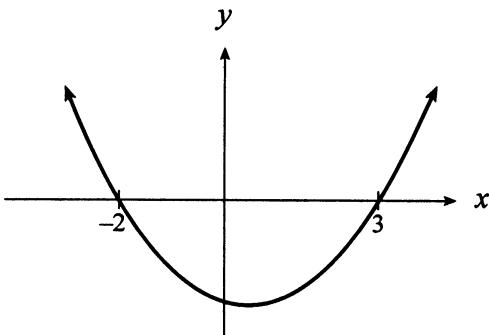
    B.
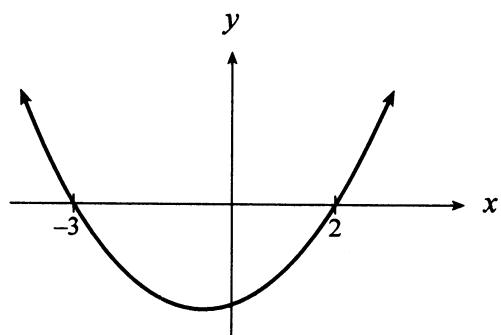
    C.
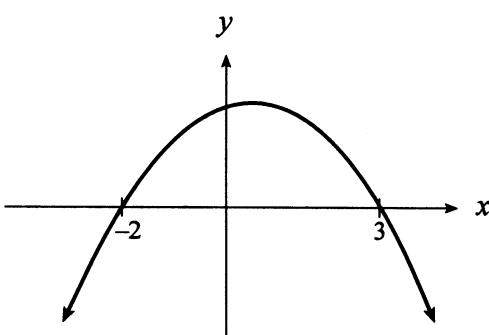
    (D.)
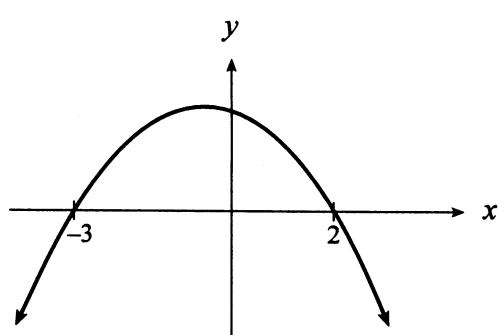
3. Given that $(x-2)$ is a factor of $p(x)$, what must be true for the graph of $y = p(x)$?

    (handwritten: If x-2 is a factor)

    A. y-intercept of -2

    B. y-intercept of 2

    C. x-intercept of -2

    (D.) x-intercept of 2

    (handwritten box: $P(2) = 0$)
    (handwritten: $x \quad y$)
    (handwritten: $P(2) = 0$)

4. Given the following table of values for the polynomial function $f(x)$, between which two consecutive x-values must a zero be located?

x	y
-1	8
0	3
1	1
2	-4
3	-7

y value changes from POSt to NEG—

A. between -1 and 0
B. between 0 and 1
Ⓒ between 1 and 2
D. between 2 and 3

large than zero

pos   5.87

neg
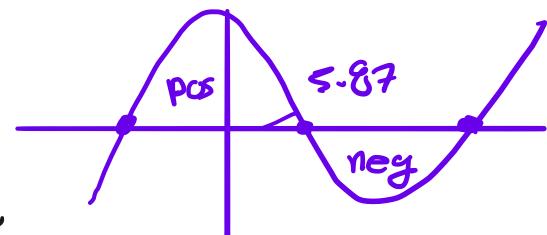
5. Solve: $x^3 - 14x^2 > 17x - 380$

$$x^3 - 14x^2 - 17x + 380 > 0$$

Ⓐ $-4.95 < x < 5.87$ or $x > 13.08$
B. $x < -4.95$ or $5.87 < x < 13.08$
C. $x > 14.62$
D. $x > -8.82$

-10 20

-400 400

-2000 2000
            -4.94
                5.87
            13.07

6. If the polynomial $p(x) = ax^2 + bx - 6$ is divided by $(x-1)$, the remainder is -9. When $p(x)$ is divided by $(x+2)$, the remainder is 12. Find the value of b.

★★★

Ⓐ -5
B. -2
C. 2
D. 5

$P(1) = A(1)^2 + b(1) - 6$

$-9 = A(1)^2 + b(1) - 6$

add

$-3 = A + B$
$12 = 4A - 2B - 6$
$18 = 4A - 2B$
$9 = 2A - B$

$P(-2) = A(-2)^2 + b(-2) - 6$

$12 = A(-2)^2 + b(-2) - 6$

$-9 = A + b - 6$

$-9 + 6 - b = A$

$-3 - b = A$

$12 = 4A - 2b - 6$

$-3 - b = 2$
$-b = 5$ $b = -5$

$12 = 4(-3-b) - 2b - 6$

$12 = -12 - 4b - 2b - 6$

$12 + 12 + 6 = -6b$

$30 = -6b$

$\dfrac{}{-6} \quad \dfrac{}{-6}$

$a + b = -3$
$2a - b = 9$
$\overline{}$
$3a = 6 \quad \boxed{a = 2}$

$\boxed{b = -5}$

7. Determine the number of real zeros of the function graphed below.
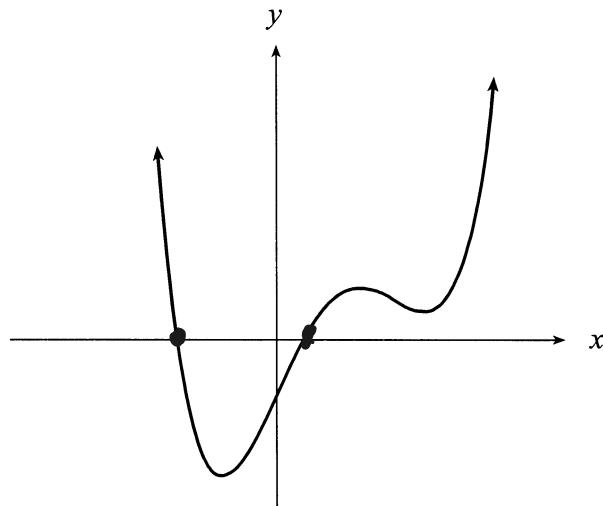
A.   1
(B)   2
C.   3
D.   4

8. Find the quotient when $2x^3 - 3x^2 + 2x - 8$ is divided by $x + 1$.

Rem. Thm

$\boxed{P(-1)} = -2 - 3 - 2 - 8 = \dfrac{-15}{}$

A. $x^2 - 2x$
B. $x^2 - 4x + 6$
C. $2x^2 - x + 1$
(D.) $2x^2 - 5x + 7$

$\begin{array}{r} 2x^2 - 5x + 7 \\ x+1 \overline{\smash{\big)}\, 2x^3 - 3x^2 + 2x - 8} \\ -(2x^3 + 2x^2) \\ \hline -5x^2 + 2x \\ -(-5x^2 - 5x) \\ \hline 7x - 8 \quad -15 \end{array}$

9. The polynomial equation $mx^3 + 7x^2 - 3x + n = 0$, where m and n are integers, has a root of $\dfrac{4}{9}$. According to the Rational Root Theorem, which of the following could be a value for m?

(9)   4

$1, 3, 18, \quad P\left(\tfrac{4}{9}\right) \Rightarrow \left(x - \tfrac{4}{9}\right)$

A.   2   3
B.   4
C.   6
(D)   18

$\boxed{9x - 4}$

$\dfrac{\text{factors of } n}{m} = \dfrac{4}{9}$

$m = 9, 18, 27, 36 \qquad \underline{\text{mult. of } 9}$

(number line showing b, b, b, b marks at -1, 0, 1)
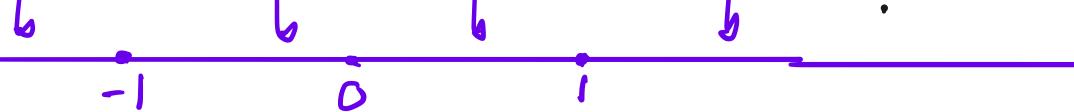
10. Solve: $x^3 < x$

$x^3 - x < 0$

$x(x^2 - 1) < 0$

$\boxed{x(x-1)(x+1) < 0}$

A. $x < 0,\ x > 1$
B. $-1 < x < 1$
C. $-1 < x < 0,\ x > 1$
D. $x < -1,\ 0 < x < 1$ (circled) ✓
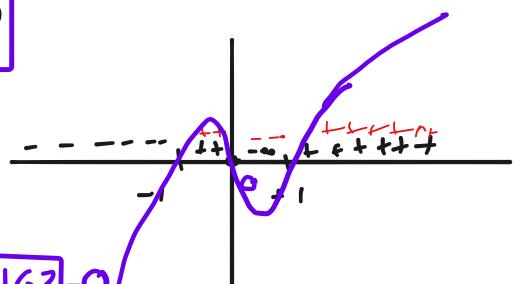
11. Solve: $x^3 + 2x^2 - 104x + 192 = 30$

A. 1.65, 8.24
B. 2.37, 7.73
C. −12.11, 2.37, 7.73
D. −11.89, 1.65, 8.24 (circled) ✓

$\boxed{x^3 + 2x^2 - 104x + 162 = 0}$

$-15 < x < 15$

$-400 < y < 800$

6

12. The points $(-2,0)$ $(0,5)$ and $(2,-4)$ are on the graph of a third degree polynomial function, $y = p(x)$. If $p(x)$ is divided by $x - 2$, determine the remainder.

A. −4 (circled)
B. 0
C. 4
D. 5

$x-2 \overline{)\ p(x)}$

-4

Rem = P(2)   My laptep

13. According to the Rational Root Theorem, list the possible rational roots of the equation $5x^3 + mx^2 + nx + 2 = 0$, where m and n are integers.

A. $\pm 1,\ \pm 2$
B. $\pm 1,\ \pm 5$
C. $\pm 1,\ \pm 5,\ \pm\dfrac{1}{2},\ \pm\dfrac{5}{2}$
D. $\pm 1,\ \pm 2,\ \pm\dfrac{1}{5},\ \pm\dfrac{2}{5}$

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14. If $x + 7$ is a factor of $p(x)$, then which of the following must be true?

A. $p(-7) = 0$
B. $p(7) = 0$
C. $p(0) = -7$
D. $p(0) = 7$

15. Determine the number of real roots of $x^3 - 12x^2 - x - 3.2 = 0$

   A.   0
   B.   1
   C.   2
   D.   3

16. Determine the remainder:

$$x^2 + x + 1 \overline{\smash{\big)}\ 2x^4 + 2x^3 - x^2 + 3x - 1}$$

   A.   2
   B. $2x$
   C. $2x - 2$
   D. $6x + 2$

17. The function $h(x)$ is the product of a 3rd degree polynomial function and a 2nd degree polynomial function. What is the maximum number of zeros of $h(x)$?

   A.   2
   B.   3
   C.   5
   D.   6

18. Which graph could represent $f(x) = x(a-x)(x-b)^2(x-c)^3$, where a, b, and c are constants?

A.
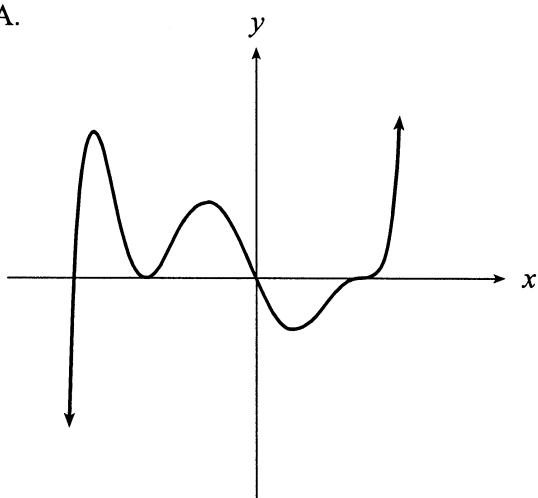
B.
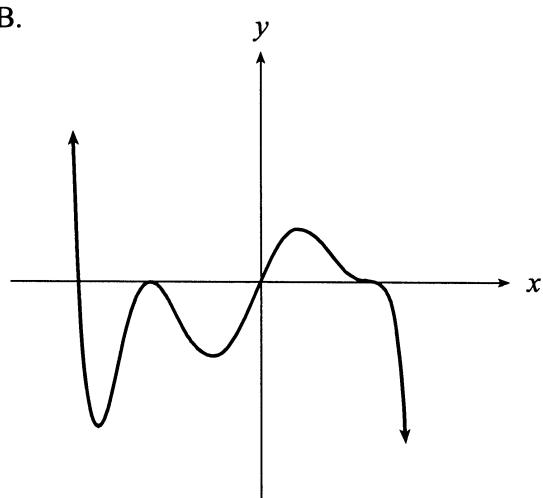
C.
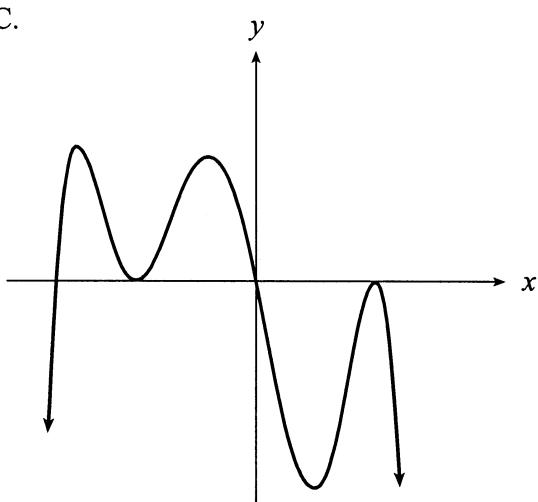
D.
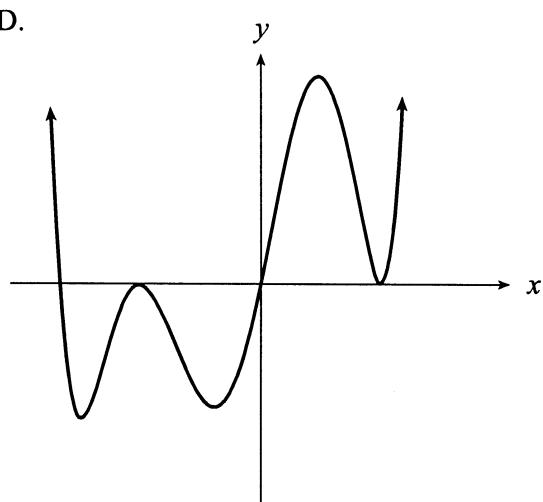
19. Which expression represents the remainder when the polynomial $p(x)$ is divided by $x-9$?

A. $p(9)$

B. $p(-9)$

C. $p(0)$

D. $p(x-9)$

20. According to the Rational Root Theorem, which of the following is a possible root of the equation $5x^3 + mx^2 + nx + 20 = 0$, where m and n are integers?

A. $\dfrac{1}{10}$

B. $\dfrac{1}{5}$

C. $\dfrac{1}{4}$

D. $\dfrac{1}{2}$

21. Determine the quotient when $x^4 - 8x^2 + 2x - 7$ is divided by $x + 3$.

A. $x^2 - 5x - 13$
B. $x^2 - 11x + 35$
C. $x^3 - 3x^2 + x - 1$
D. $x^3 + 3x^2 + x + 5$

22. Determine the value of k if $x - 2$ is a factor of the polynomial $x^3 - 4x^2 + kx + 6$.

A. -9
B. -1
C. 1
D. 9

23. Solve $(x+a)^2 (x+b)(x+c) < 0$ where a, b, c are real number constants and $0 < a < b < c$.

A. $b < x < c$
B. $-b < x < -c$
C. $-c < x < -b$
D. $-b < x < -a, \ x < -c$

1. **D**
2. **D**
3. **D**
4. **C**
5. **A**
6. **A**
7. **B**
8. **D**
9. **D**
10. **D**
11. **D**
12. **A**
13. **D**
14. **A**
15. **B**
16. **D**
17. **C**
18. **B**
19. **A**
20. **B**
21. **C**
22. **C**
23. **C**

$3(\ 2a + 4b = 5\ )$

$4(\ a\ -3b = 3\ )$

Cancel b out

$a - 3b = 3$

$\dfrac{27}{10} - 3b = 3$

$6a + 12b = 15$

$4a - 12b = 12$

$10a \qquad = 27$

$a = \dfrac{27}{10}$