

Homework 3.1

Completely factor each of the following polynomials.

<p>1. $12x^3 - 14x^2 - 6x$</p> <p>$M = -15x^2$ $A = -7x$ $N = -9x^2$</p> $= 2x(6x^2 - 7x - 3)$ $= 2x[6x^2 - 9x + 2x - 3]$ $= 2x[3x(2x - 3) + 1(2x - 3)]$ $= 2x(2x - 3)(3x + 1)$	<p>2. $6x^3 - 3x^5 + 24x$</p> $= -3x^5 + 6x^3 + 24x$ $= -3x(x^4 - 2x^2 - 8)$ $= -3x(x^2 - 4)(x^2 + 2)$ $= -3x(x - 2)(x + 2)(x^2 + 2)$	<p>3. $-4x^2 - 14x^3 - 6x^4$</p> $= -6x^4 - 14x^3 - 4x^2$ $= -2x^2(3x^2 + 7x + 2)$ $= -2x^2[3x^2 + x + 6x + 2]$ $= -2x^2[x(3x + 1) + 2(3x + 1)]$ $= -2x^2(3x + 1)(x + 2)$
<p>4. $x^3 - 3x^2 - 9x + 27$</p> $= x^2(x - 3) - 9(x - 3)$ $= (x - 3)(x^2 - 9)$ $= (x - 3)(x - 3)(x + 3)$	<p>5. $3x^2 - 2x^3 + 8x - 12$</p> $= -2x^3 + 3x^2 + 8x - 12$ $= -x^2(2x - 3) + 4(2x - 3)$ $= (2x - 3)(-x^2 + 4)$ $= (2x - 3)(-1)(x^2 - 4)$ $= -(2x - 3)(x - 2)(x + 2)$	<p>6. $-2x^3 + 18x$</p> $= -2x(x^2 - 9)$ $= -2x(x - 3)(x + 3)$
<p>7. $2x^4 - x^2 - 15$</p> $= 2x^4 - 6x^2 + 5x^2 - 15$ $= 2x^2(x^2 - 3) + 5(x^2 - 3)$ $= (x^2 - 3)(2x^2 + 5)$	<p>8. $x^4 - x^2 - 12$</p> $= (x^2 - 4)(x^2 + 3)$ $= (x - 2)(x + 2)(x^2 + 3)$	<p>9. $6x^5 + 9x^3 - 27x$</p> $= 3x(2x^4 + 3x^2 - 9)$ $= 3x[2x^4 + 6x^2 - 3x^2 - 9]$ $= 3x[2x^2(x^2 + 3) - 3(x^2 + 3)]$ $= 3x(x^2 + 3)(2x^2 - 3)$

Factor each of the polynomial functions. Then, identify the zeros of the function. Show your work.

<p>10. $f(x) = 5x^3 - 20x$</p> $f(x) = 5x(x^2 - 4)$ $f(x) = 5x(x-2)(x+2)$ $\begin{cases} 0 = 5x \\ 0 = x \end{cases} \quad \begin{cases} 0 = x-2 \\ 2 = x \end{cases} \quad \begin{cases} 0 = x+2 \\ -2 = x \end{cases}$ <p>$x = -2, 2, 0$</p>	<p>11. $g(x) = 3x^3 - 3x^2 - 18x$</p> $g(x) = 3x(x^2 - x - 6)$ $g(x) = 3x(x-3)(x+2)$ $\begin{cases} 0 = 3x \\ 0 = x \end{cases} \quad \begin{cases} 0 = x-3 \\ 3 = x \end{cases} \quad \begin{cases} 0 = x+2 \\ -2 = x \end{cases}$ <p>$x = -2, 0, 3$</p>	<p>12. $h(x) = -10x^3 + 26x^2 + 12x$</p> $h(x) = -2x(5x^2 - 13x - 6)$ $h(x) = -2x[5x^2 - 15x + 2x - 6]$ $h(x) = -2x[5x(x-3) + 2(x-3)]$ $h(x) = -2x(x-3)(5x+2)$ $\begin{cases} 0 = -2x \\ 0 = x \end{cases} \quad \begin{cases} 0 = x-3 \\ 3 = x \end{cases} \quad \begin{cases} 0 = 5x+2 \\ -2 = 5x \\ -45 = x \end{cases}$ <p>$x = -45, 0, 3$</p>									
<p>13. $p(x) = x^3 + 2x^2 - 4x - 8$</p> $p(x) = x^2(x+2) - 4(x+2)$ $p(x) = (x+2)(x^2 - 4)$ $p(x) = (x+2)(x+2)(x-2)$ $\begin{cases} 0 = x+2 \\ -2 = x \end{cases} \quad \begin{cases} 0 = x+2 \\ -2 = x \end{cases} \quad \begin{cases} 0 = x-2 \\ 2 = x \end{cases}$ <p>$x = -2, -2, 2$</p>	<p>14. $q(x) = 3x^3 + 5x^2 - 3x - 5$</p> $q(x) = x^2(3x+5) - 1(3x+5)$ $q(x) = (3x+5)(x^2 - 1)$ $q(x) = (3x+5)(x-1)(x+1)$ $\begin{cases} 0 = 3x+5 \\ -5 = 3x \\ -5/3 = x \end{cases} \quad \begin{cases} 0 = x-1 \\ 1 = x \end{cases} \quad \begin{cases} x+1=0 \\ x=-1 \end{cases}$ <p>$x = -5/3, -1, 1$</p>	<p>15. $r(x) = x^4 - 10x^2 + 9$</p> $r(x) = x^4 - 9x^2 - x^2 + 9$ $r(x) = x^2(x^2 - 9) - 1(x^2 - 9)$ $r(x) = (x^2 - 9)(x^2 - 1)$ $r(x) = (x-3)(x+3)(x-1)(x+1)$ $\begin{cases} 0 = x-3 \\ 3 = x \end{cases} \quad \begin{cases} 0 = x+3 \\ -3 = x \end{cases} \quad \begin{cases} 0 = x-1 \\ 1 = x \end{cases} \quad \begin{cases} 0 = x+1 \\ -1 = x \end{cases}$ <p>$x = -3, -1, 1, 3$</p>									
<p>16. $m(x) = x^4 - 2x^3 - 15x^2$</p> $m(x) = x^2(x^2 - 2x - 15)$ $m(x) = x^2(x^2 - 5x + 3x - 15)$ $m(x) = x^2[x(x-5) + 3(x-5)]$ $m(x) = x^2(x-5)(x+3)$ $\begin{cases} 0 = x^2 \\ 0 = x \end{cases} \quad \begin{cases} 0 = x-5 \\ 5 = x \end{cases} \quad \begin{cases} 0 = x+3 \\ -3 = x \end{cases}$ <p>$x = -3, 0, 5$</p>	<p>17. $g(x) = 4x^3 + 16x^2 + 16x$</p> $g(x) = 4x(x^2 + 4x + 4)$ $g(x) = 4x(x+2)^2$ $\begin{cases} 0 = 4x \\ 0 = x \end{cases} \quad \begin{cases} x+2=0 \\ x=-2 \end{cases}$ <p>$x = -2, -2, 0$</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p style="text-align: center; margin: 0;">Perfect Tri</p> <table style="margin: 0 auto; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">x</td> <td style="padding: 2px 5px;">$+2$</td> <td></td> </tr> <tr> <td style="padding: 2px 5px;">x</td> <td style="padding: 2px 5px;">$2x$</td> <td style="padding: 2px 5px;">4</td> </tr> <tr> <td style="padding: 2px 5px;">$+2x$</td> <td style="padding: 2px 5px;">4</td> <td style="padding: 2px 5px;">2</td> </tr> </table> </div>	x	$+2$		x	$2x$	4	$+2x$	4	2	<p>18. $h(x) = 2x^3 + 3x^2 - 8x - 12$</p> $h(x) = x^2(2x+3) - 4(2x+3)$ $h(x) = (2x+3)(x^2 - 4)$ $h(x) = (2x+3)(x-2)(x+2)$ $\begin{cases} 0 = 2x+3 \\ -3 = 2x \\ -3/2 = x \end{cases} \quad \begin{cases} 0 = x-2 \\ 2 = x \end{cases} \quad \begin{cases} 0 = x+2 \\ -2 = x \end{cases}$ <p>$x = -2, -3/2, 2$</p>
x	$+2$										
x	$2x$	4									
$+2x$	4	2									

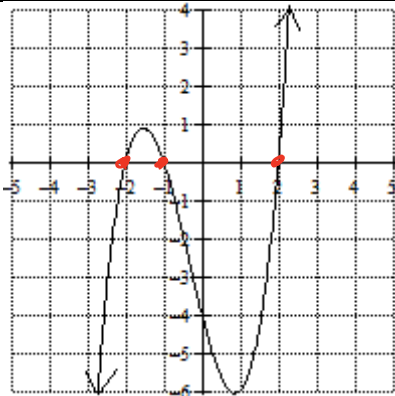
Pictured below is the graph of a polynomial function, $f(x)$. Use the graph to answer the questions that follow.

19. Identify the zeros of $f(x)$.

$$x = -2$$

$$x = -1$$

$$x = 2$$



20. Based on the graph, what are the coordinates of the y -intercept?

$$(0, -4)$$

21. Write the equation of $f(x)$ in factored form.

$$f(x) = (x+2)(x+1)(x-2)$$

22. Rewrite the factored equation in standard form.

$$f(x) = (x+2)(x+1)(x-2)$$

$$f(x) = (x^2 - 4)(x+1)$$

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

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

23. What is the constant term in the standard form equation of $f(x)$? State the connection that this term in the equation has with the graph of $f(x)$.

The constant term is -4 which is the y -coordinate of the y -intercept of the graph.

