3.2 WS

KEY

Examine the leading term to determine the far-left and far-right behavior of the graph of each polynomial function.

1. $P(x) = 3x^4 - 2x^2 - 7x + 1$

Far-left: Up (∞)
Far-right: Up (∞)

2. $P(x) = -2x^3 - 6x^2 + 5x - 1$

Far-left: Up (∞)
Far-right: Down ($-\infty$)

3. $P(x) = 5x^5 - 4x^3 - 17x^2 + 2$

Far-left: Down ($-\infty$)
Far-right: Up (∞)

4. $P(x) = -6x^4 - 3x^3 + 5x^2 - 2x + 5$

Far-left: Down ($-\infty$)
Far-right: Down ($-\infty$)

Find all relative and absolute extreme values.

5. $P(x) = x^3 + x^2 - 9x - 9$

Relative max of 5.05 at -2.1.
Relative min of -16.9 at 1.43.

6. $P(x) = x^3 + 4x^2 - 4x - 16$

Relative max of 5.05 at -3.1.
Relative min of -16.9 at .43.

7. $P(x) = x^4 - 4x^3 - 2x^2 + 12x - 5$

Relative max of 2 at 1.
Absolute min of -14 at -1 and -14 at 3.

Find all the real zeros of each polynomial by factoring.

8. $P(x) = x^3 - 2x^2 - 15x$

$\boxed{x = -3, 0, 5}$

9. $P(x) = x^4 - 13x^2 + 36$

$\boxed{x = \pm 2, \pm 3}$

Use long division to divide the polynomials.

10. $\dfrac{2x^3-3x^2+4x+5}{x+2}$

$$
\begin{array}{r}
2x^2-7x+18 \\
x+2\,\overline{)\,2x^3-3x^2+4x+5} \\
-2x^3 \mp 4x^2 \\
\hline
-7x^2+4x+5 \\
+7x^2+14x \\
\hline
18x+5 \\
-18x \mp 36 \\
\hline
-31
\end{array}
$$

$\boxed{2x^2-7x+18+\frac{-31}{x+2}}$

11. $\dfrac{11x^2-31x+6x^3+15}{3x+2}$

$$
\begin{array}{r}
2x^2+\frac{7}{3}x-\frac{107}{9} \\
3x+2\,\overline{)\,6x^3+11x^2-31x+15} \\
-6x^3 \mp 4x^2 \\
\hline
7x^2-31x+15 \\
-7x^2 \mp \frac{14}{3}x \\
\hline
-\frac{107}{3}x+15 \\
+\frac{107}{3}x+\frac{214}{9} \\
\hline
\frac{349}{9}
\end{array}
$$

$\boxed{2x^2+\frac{7}{3}x-\frac{107}{9}+\frac{349}{27x+18}}$

Use synthetic division to divide the polynomial.

12. $\dfrac{4x^3+10x^2-6x-20}{x+2}$

$$
\begin{array}{r|rrrr}
-2 & 4 & 10 & -6 & -20 \\
 & \downarrow & -8 & -4 & 20 \\
\hline
 & 4 & 2 & -10 & 0
\end{array}
$$

$\boxed{4x^2+2x-10}$

13. $\dfrac{10x^3-9x^4+7x^2-6}{x-1}$

$$
\begin{array}{r|rrrrr}
1 & -9 & 10 & 7 & 0 & -6 \\
 & \downarrow & -9 & 1 & 8 & 8 \\
\hline
 & -9 & 1 & 8 & 8 & 2
\end{array}
$$

$\boxed{-9x^3+x^2+8x+8+\frac{2}{x-1}}$

Use synthetic division to determine whether the binomial is a factor of $P(x)$.

14. $P(x)=4x^3-3x^2-8x+4,\ x-2$

$$
\begin{array}{r|rrrr}
2 & 4 & -3 & -8 & 4 \\
 & & 8 & 10 & 4 \\
\hline
 & 4 & 5 & 2 & 8
\end{array}
$$

$\boxed{\text{No}}$

15. $P(x)=3x^4-3x+x^3+1,\ x+\dfrac{1}{3}$

$$
\begin{array}{r|rrrrr}
-\frac{1}{3} & 3 & 1 & 0 & -3 & 1 \\
 & & -1 & 0 & 0 & 1 \\
\hline
 & 3 & 0 & 0 & -3 & 2
\end{array}
$$

$\boxed{\text{No}}$