Questions on 3.7 and 3.8 HW?

Remainder Theorem (pg.35):

$f(a)$ $f(3)$ If $f(a)=0$, then

$(x-a)$ $(x-3)$ $x-a$ is a root of the polynomial.

⑨ $f(x)=x^3+5x^2+2x-8$; $f(1)$ $(x-1)$

$f(1)=(1)^3+5(1)^2+2(1)-8 = 1+5+2-8$

$f(1)=0$ yes, $x-1$ is a factor

OR yes, 1 is a root

Polynomial Division

Just like with whole numbers, we can divide polynomials too!

Practice.

484/4

$484 \div 4$

$$\begin{array}{r} 121 \\ 4\,\overline{)\,484} \\ -4 \\ \hline 08 \\ -8 \\ \hline 04 \\ -4 \\ \hline 0 \end{array}$$

121 R:0

$121\frac{0}{4}$

$$\left(3k^4 + 40k^3 + 5k^2\right) \div 10k^2$$

$$\begin{array}{r} \frac{3}{10}k^2 + 4k + \frac{1}{2} \\ 10k^2\,\overline{)\,3k^4 + 40k^3 + 5k^2} \\ -3k^4 \\ \hline 0 + 40k^3 \\ -40k^3 \\ \hline 0 + 5k^2 \\ 5k^2 \\ \hline 0 \end{array}$$

$\frac{3k^4}{10k^2}$ $\qquad \frac{40k^3}{10k^2}$ $\qquad \frac{5k^2}{10k^2}$

$\frac{3}{10}k^2 \cdot 10k^2$ $\qquad 4k \cdot 10k^2$ $\qquad \frac{1}{2} \cdot 10k^2$

$10 \cdot \frac{3}{10} = 3$

$\frac{3}{10}k^2 \cdot 10k^2 = 3k^4$

Quotient: $\frac{3}{10}k^2 + 4k + \frac{1}{2}$

$$\left(m^3 + m^2 - 28m - 19\right) \div (m - 5)$$

$$\begin{array}{r} m^2 + 6m + 2 \\ m - 5\,\overline{)\,m^3 + m^2 - 28m - 19} \end{array}$$

Practice.

$$\left(x^3 - x^2 - 32x + 62\right) \div (x+6)$$

$x^2 - 7x + 10$

$x+6\,\overline{)\,x^3 - x^2 - 32x + 62}$

$-(x^3 + 6x^2)$

$-7x^2 - 32x$

$-(-7x^2 - 42x)$

$10x + 62$

$-(10x + 60)$

2

$-x^2 + 7x^2 \quad$ (written: $-x^2 + 6x^2$, with 7 written over the 6)

$-32x - {-42x}$

Answer:

$x^2 - 7x + 10 + \frac{2}{x+6}$

$$\left(b^3 - 5b^2 - 8\right) \div (b-5)$$

$b^3 - 5b^2 + 0b - 8 \div (b-5)$

$b^2 + 0$

$b-5\,\overline{)\,b^3 - 5b^2 + 0b - 8}$

$-(b^3 - 5b^2)$

$0 + 0b$

$0b$

$0 \; -8$

Answer:

$b^2 - \frac{8}{b-5}$

$$\left(3x^3 - 15x^2 - 13x - 25\right) \div (x-6)$$

$3x^2 + 3x + 5$

$x-6\,\overline{)\,3x^3 - 15x^2 - 13x - 25}$

$-(3x^3 - 18x^2)$

$3x^2 - 13x$

$-(3x^2 - 18x)$

$5x - 25$

$-(5x - 30)$

5

$-15x^2 - {-18x^2}$

$-13x - {-18x}$

$-25 - {-30}$

Answer:

$3x^2 + 3x + 5 + \frac{5}{x-6}$

Practice.

① $(3n^3 - 14n^2 - 45n - 37) \div (3n + 4)$

② $(6p^3 - 7p^2 + 5) \div (6p - 7)$

③ $(2x^3 - x^2 - 8) \div (2x - 1)$

④ $(8a^3 + 7a^2 - 15a + 3) \div (a + 2)$

⑤ $(9n^3 + 10n^2 + 6) \div (9n + 10)$

⑥ $(v^3 - 4v^2 - 29v - 19) \div (v - 8)$

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Rational Root Theorem:

$$a_n x^n + a_{n-1} x^{n-1} + \cdots + a_0 = 0$$

-Possible rational roots are p/q, where p is an integer factor of the constant term (a_0) and q is an integer factor of the leading coefficient (a_n).

Practice.

State the possible rational zeros for each function. Then find all rational zeros.

$$f(x) = 9x^3 - 6x^2 + 34x - 11$$

$$f(x) = 2x^3 - x^2 - 2x + 1$$

$$f(x) = x^3 - 5x^2 - 15x + 27$$

$$f(x) = 2x^3 - 5x^2 + 4x - 1$$

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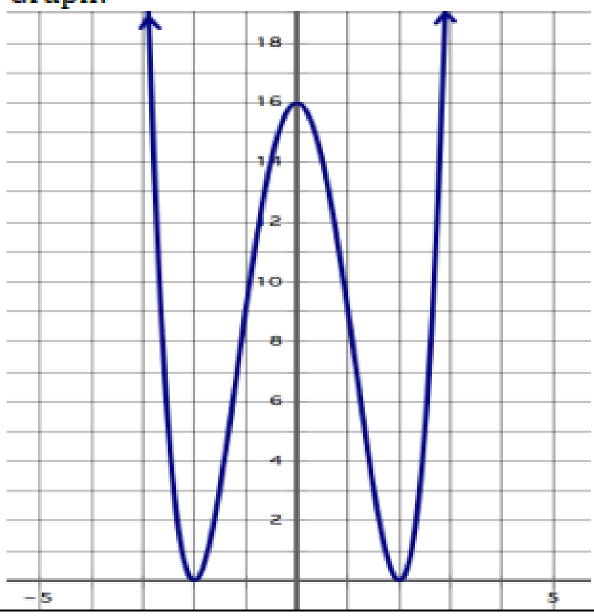
From 3.8...turn to page 37

4.	**Function:** $f(x) = 2(x-1)(x+3)^2$ **End behavior:** $as\ \ x \to -\infty, \quad f(x) \to$ ____ $as\ \ x \to \ \infty, \quad f(x) \to$ ____ **Roots (with multiplicity):** **Value of leading co-efficient:** **Domain:** **Range:** All Real numbers	Graph:
5.	**Function:** **End behavior:** $as\ \ x \to -\infty, \quad f(x) \to \infty$ $as\ \ x \to \ \infty, \quad f(x) \to$ ____ **Roots (with multiplicity):** (3,0) m: 1; (-1,0) m: 2 (0,0) m: 2 **Value of leading co-efficient:** -1 **Domain:** **Range:**	Graph:

6.	**Function:** **End behavior:** *as* $x \to -\infty$, $f(x) \to$ ____ *as* $x \to \infty$, $f(x) \to$ ____ **Roots (with multiplicity):** **Value of leading co-efficient:** 1 **Domain:** **Range:** **Other:** $f(-2) = 0$	Graph: 

Without using technology, sketch the graph of the polynomial function described. The term "imaginary roots" means complex zeros.

7. A cubic function with a leading coefficient of -2, with two negative zeros and one positive.

8. A quartic function with a leading coefficient of 1, with two negative zeros and one positive double zero.

9. A cubic function with a leading coefficient of -3, with an imaginary root and one positive double root.

10. A quartic function with a leading coefficient of -2, with two negative zeros and one positive double root.

Find all factors and sketch the graph of the polynomial functions.

11. $f(x) = x^3 - x^2$

12. $f(x) = x^4 - x^2$

13. $f(x) = x^3 - 2x$

14. $f(x) = x^3 - x^2 + 9x - 9$