Warm-Up:
Solve for *x*.

$x^8 - 97x^4 + 1296 = 0$

$(x^4-81)(x^4-16)=0$

$(x^2+9)(x^2-9)(x^2-4)(x^2+4)=0$

$x^2+9=0$

$\sqrt{x^2}=\pm\sqrt{-9}$

$x=\pm 3i$

$x^2-9=0$

$\sqrt{x^2}=\pm\sqrt{9}$

$x=\pm 3$

$x^2-4=0$

$\sqrt{x^2}=\pm\sqrt{4}$

$x=\pm 2$

$x^2+4=0$

$\sqrt{x^2}=\pm\sqrt{-4}$

$x=\pm 2i$

46, 32, 34

32) $x^4+6x^2-27=0$

$(x^2+9)(x^2-3)=0$

$x^2+9=0$

$\sqrt{x^2}=\pm\sqrt{-9}$

$x^2-3=0$

$\sqrt{x^2}=\pm\sqrt{3}$

$x=\pm 3i, \pm\sqrt{3}$

34) $27x^3+1=0$

$a^3+b^3=(a+b)(a^2-ab+b^2)$

$a=3x \quad b=1$

$(3x+1)(9x^2-3x+1)=0$

$3x+1=0$

$3x=-1$

$x=\frac{-1}{3}$

$9x^2-3x+1=0$

$x=\frac{3\pm\sqrt{9-4(9)(1)}}{2(9)}$

$x=\frac{3\pm\sqrt{9-36}}{18}$

$x=\frac{3\pm\sqrt{-27}}{18}=\frac{3\pm\sqrt{-9}\sqrt{3}}{18}$

$x=\frac{3\pm 3i\sqrt{3}}{18}$

$x=\frac{1\pm i\sqrt{3}}{6}$

46) x^4-81

$(x^2-9)(x^2+9)$

$\boxed{(x+3)(x-3)(x^2+9)}$

Section 6-7: The Remainder Theorem

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

Find $(3x^5 - 2x^4 + x^3 - 2x^2 + 3) \div (x - 6)$ using synthetic divsion.

$$\begin{array}{r|rrrrrr} 6 & 3 & -2 & 1 & -2 & 0 & 3 \\ & \downarrow & 18 & 96 & 582 & 3480 & 20880 \\ \hline & 3 & 16 & 97 & 580 & 3480 & \boxed{20883} \end{array}$$

$3x^4 + 16x^3 + 97x^2 + 580x + 3480 + \frac{20883}{x-6}$

Find $f(6)$.

$f(6) = 20,883$

The Remainder Theorem:

The value of a function when $x = a$ is the same as that function's remainder when divided by $(x - a)$.

When synthetic division is used to evaluate a function, it is called synthetic substitution.

Examples:

1) Use synthetic substitution to find $f(-3)$.

$f(x) = x^5 + 7x^3 - 4x - 10$

$$
\begin{array}{r|rrrrrr}
-3 & 1 & 0 & 7 & 0 & -4 & -10 \\
 & \downarrow & -3 & 9 & -48 & 144 & -420 \\
\hline
 & 1 & -3 & 16 & -48 & 140 & \boxed{-430}
\end{array}
$$

$f(-3) = -430$

Examples:

2) Show that x - 3 is a factor of $x^3 + 4x^2 - 15x - 18$. Then find the remaining factors of the polynomial.

$$
\begin{array}{r|rrrr}
3 & 1 & 4 & -15 & -18 \\
 & \downarrow & 3 & 21 & 18 \\
\hline
 & 1 & 7 & 6 & \boxed{0} \\
 & x^2 & x & \# &
\end{array}
$$

$x^2 + 7x + 6$

$(x+1)(x+6)$

Homework: pg. 359 #10-24 even, ~~28~~, ~~30~~, ~~31~~, 34, 46, 47

Ch. 6 Test January 5/6