HW #19 3.3 6, 8, 16, 20, 24, 26, 46, 54, 60, 66

6) $P(x) = 4x^3 + 7x + 9 \qquad D(x) = 2x + 1$

$$
\begin{array}{r}
2x^2 - x + 4 \\
2x+1 \overline{)\, 4x^3 \qquad + 7x + 9} \\
\underline{4x^3 + 2x^2} \qquad\qquad \\
-2x^2 + 7x \qquad \\
\underline{-2x^2 - x} \qquad \\
8x + 9 \\
\underline{8x + 4} \\
5
\end{array}
$$

so, $P(x) = 4x^3 + 7x + 9 \boxed{= (2x^2 - x + 4)(2x + 1) + 5}$

8) $P(x) = 2x^5 + 4x^4 - 4x^3 - x - 3 \qquad D(x) = x^2 - 2$

$$
\begin{array}{r}
2x^3 + 4x^2 \qquad + 8 \\
x^2 - 2 \overline{)\, 2x^5 - 4x^4 - 4x^3 + 0x^2 - x - 3} \\
\underline{2x^5 \qquad - 4x^3} \qquad\qquad\qquad \\
4x^4 \qquad + 0x^2 \qquad\quad \\
\underline{4x^4 \qquad - 8x^2} \qquad\quad \\
8x^2 - x - 3 \\
\underline{8x^2 \qquad - 16} \\
-x + 13
\end{array}
$$

so, $\boxed{P(x) = (x^2 - 2)(2x^3 + 4x^2 + 8) + (-x + 13)}$

16) $\dfrac{x^3 - x^2 - 2x + 6}{x - 2} =$

$$
\begin{array}{r}
x^2 + x \qquad \\
x - 2 \overline{)\, x^3 - x^2 - 2x + 6} \\
\underline{x^3 - 2x^2} \qquad\qquad \\
x^2 - 2x \qquad \\
\underline{x^2 - 2x} \qquad \\
+6
\end{array}
$$

so, $\boxed{\begin{array}{l} \text{quotient} = x^2 + x \\ \text{remainder} = 6 \end{array}}$

20) $\dfrac{3x^4 - 5x^3 - 20x - 5}{x^2 + x + 3} =$

$$
\begin{array}{r}
3x^2 - 8x - 1 \qquad \\
x^2 + x + 3 \overline{)\, 3x^4 - 5x^3 + 0x^2 - 20x - 5} \\
\underline{3x^4 + 3x^3 + 9x^2} \qquad\qquad\quad \\
-8x^3 - 9x^2 - 20x \qquad \\
\underline{-8x^3 - 8x^2 - 24x} \qquad \\
-x^2 + 4x - 5 \\
\underline{-x^2 - x - 3} \\
5x - 2
\end{array}
$$

so, $\boxed{\begin{array}{l} \text{quotient} = 3x^2 - 8x - 1 \\ \text{remainder} = 5x - 2 \end{array}}$

24) $\dfrac{2x^5 - 7x^4 - 13}{4x^2 - 6x + 8} =$

$$
\begin{array}{r}
\tfrac{1}{2}x^3 - x^2 - \tfrac{5}{2}x - \tfrac{7}{4} \qquad \\
4x^2 - 6x + 8 \overline{)\, 2x^5 - 7x^4 + 0x^3 + 0x^2 + 0x - 13} \\
\underline{2x^5 - 3x^4 + 4x^3} \qquad\qquad\qquad\qquad \\
-4x^4 - 4x^3 + 0x^2 \qquad\qquad\quad \\
\underline{-4x^4 + 6x^3 - 8x^2} \qquad\qquad\quad \\
-10x^3 + 8x^2 + 0x \qquad\quad \\
\underline{-10x^3 + 15x^2 - 20x} \qquad\quad \\
-7x^2 + 20x - 13 \\
\underline{-7x^2 + \tfrac{21}{2}x - 14} \\
\tfrac{19}{2}x + 1
\end{array}
$$

so, $\boxed{\begin{array}{l} \text{quotient} = \\ \tfrac{1}{2}x^3 - x^2 - \tfrac{5}{2}x - \tfrac{7}{4} \\ \text{remainder} = \\ \tfrac{19}{2}x + 1 \end{array}}$

26, 46, 54, 60, 66

26) $\dfrac{x^2-5x+4}{x-1}$ =

$$\begin{array}{r|rrr} 1 & 1 & -5 & 4 \\ & & 1 & -4 \\ \hline & 1 & -4 & 0 \end{array}$$

so, $\boxed{\begin{array}{l}\text{quotient} = x-4 \\ \text{remainder} = 0\end{array}}$

46) $P(x) = 6x^5 + 10x^3 + x + 1 \qquad c = -2$

$$\begin{array}{r|rrrrrr} -2 & 6 & 0 & 10 & 0 & 1 & 1 \\ & & -12 & 24 & -68 & 136 & -274 \\ \hline & 6 & -12 & 34 & -68 & 137 & -273 \end{array}$$

so, by the Remainder Theorem, $\boxed{P(-2) = -273}$

54) $P(x) = x^3 + 2x^2 - 3x - 10 \qquad c = 2$

$$\begin{array}{r|rrrr} 2 & 1 & 2 & -3 & -10 \\ & & 2 & 8 & 10 \\ \hline & 1 & 4 & 5 & 0 \end{array}$$

$\boxed{\text{since remainder is } 0,\ x-2 \text{ is a factor}}$

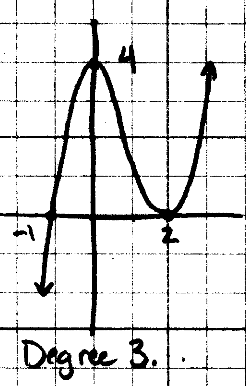
60) Degree 4; zeros: $-2, 0, 2, 4$

since zeros are $x=-2,\ x=0,\ x=2,\ x=4$
then factors are $(x+2), (x), (x-2), (x-4)$

so, $P(x) = c(x+2)(x)(x-2)(x-4)$ and if we let $c=1$

then $\boxed{P(x) = x^4 - 9x^3 - 4x^2 + 16x}$

66)



Degree 3.

y-intercept = 4
zeros: $-1, 2$ w/ 2 being degree two

so, $P(x) = C(x+1)(x-2)^2$
$= C(x^3 - 3x^2 + 4)$

since $P(0) = 4 \Rightarrow 4 = C[(0)^3 - 3(0)^2 + 4]$
$4 = 4C$
$1 = C$

so, $\boxed{P(x) = x^3 - 3x^2 + 4}$