Answer all questions to the best of your ability. Full credit will only be given if all work is shown and organized and it is clear what your answer is. The HW is out of 10 points.

- Section R.6, page 62, problems: 5(8) 11, 12, 21, 22, 26
- Section 5.5, page 385, problems: 11, 12, 17, 18, 36, 39, 49, 52, 58, 77, 78
- Section 5.6, page 392, problems: 9, 12, 15, 19, 21, 24, 25, 31, 32

**R.6.8**

\[-4x^3 + 2x^2 - x + 1\text{ divided by } x + 2\]

\[-2 \]

\[\begin{array}{rrr}
-4 & 2 & -1 \\
8 & -20 & 41 \\
-4 & 10 & -1 & 43 & \text{ remainder}
\end{array}\]

\[-4x^2 + 10x - 1\text{ quotient}\]

**R.6.2a**

Is \(x+3\) a factor of \(2x^6 - 18x^4 + x^2 - 9\)?

\[-3 \]

\[\begin{array}{rrr}
2 & 0 & -18 & 0 & 1 & 0 & -4 \\
-6 & 18 & 0 & 0 & -3 & 9 \\
2 & -6 & 0 & 0 & 1 & -3 & 0 & \text{ remainder of 0}
\end{array}\]

\(-D\) \(x+3\) is a factor

**5.5.5a**

Find real zeros: \(f(x) = 2x^4 - x^2 - 5x^2 + 2x + 2\)

Roots: possible roots are \(\pm1, \pm\frac{1}{\sqrt{2}}, \pm\sqrt{2}\)

\(f(1) = 2 - 1 - 5 + 2 + 2 = 0\)

\(\frac{\sqrt{2} - 1}{\sqrt{2} - 1} = \frac{\sqrt{2} - 1}{\sqrt{2} - 1} \cdot \frac{\sqrt{2} - 1}{\sqrt{2} - 1} = 2 - 1 - 4 - 2\)

\(2 - 1 - 4 - 2 = 0\)

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

\(= (x-1)[2x(x+1) - 2(x+1)]\)

\(= (x-1)(x+\sqrt{2})(x-x\sqrt{2})(x+1)\)

\(= 0\) real zeros are \(1, \pm\sqrt{2}, -\sqrt{2}\)
5.6.26 \[ h(x) = 3x^4 + 5x^3 + 25x^2 + 45x - 18, \quad \text{3, 3 is a zero} \]

\[ = (x-3i)(x+3i) \text{ are factors of } h(x). \]

\[ (x-3i)(x+3i) = x^2 + 9 \]

\[
\begin{align*}
&\quad 3x^2 + 5x - 2 \\
&x^2 + 9 \overline{3x^4 + 5x^3 + 25x^2 + 45x - 18} \\
&\qquad - (3x^4 + 0x^3 + 27x^2) \\
&\quad 5x^3 - 2x^2 + 45x - 18 \\
&\qquad - (5x^3 + 0x^2 + 45x) \\
&\quad -2x^2 - 18 \\
&\qquad -2x^2 - 18 \\
&\quad 0
\end{align*}
\]

\[ = (x-3i)(x+3i)(3x^2 + 5x - 2) \]

Possible rational zeros of \[ 3x^2 + 5x - 2 \] are \[ \pm 1, \pm \frac{1}{3}, \pm 2, \pm \frac{2}{3} \]

Check \[ x=2 \]

\[
\begin{array}{cccc}
-2 & | & 3 & 5 & -2 \\
& & -6 & 2 & \text{=} \text{P } x+2 \text{ is a factor} \\
& & 3 & -1 & 0 \\
\end{array}
\]

\[ h(x) = (x-3i)(x+3i)(x+2)(3x-1) \]

So zeros are \[ \pm 3i, -2, \frac{1}{3} \]

5.6.32 \[ f(x) = x^4 - 1 = (x^2 + 1)(x^2 - 1) = (x+i)(x-i)(x+1)(x-1) \]

\[ \text{Thus zeros are } \pm 1, \pm i \]