1. Find the Quotient and Remainder when $s^4 - 3s^2 + 6$ is divided by $s^2 - 5$, using ordinary (long) division. (Synthetic Division only works for divisors that are linear, i.e., 1st-degree polynomials. Interpret your work by writing $Dividend = (Divisor)(Quotient) + Remainder$.

#s 2 – 5 Use synthetic division to find the quotient and remainder when the first polynomial is divided by the second.

2. $x^2 + 4x + 1; \quad x - 2$
3. $-x^3 + x^2 - 4x + 9; \quad x + 3$
4. $4x^3 - 5x + 2; \quad x - \frac{1}{2}$
5. $2a^3 - 3a^2 + 4a + 3; \quad a + \frac{1}{2}$

#s 6, 7 Given $f(x) = x^5 - 1$ and $g(x) = x^3 - 4x^2 + 8$, find the functional values using synthetic division.

6. $f(1)$
7. $g\left(-\frac{1}{2}\right)$

#s 8, 9 Determine if the binomial is a factor of the given (higher-degree) polynomial. If it is, then factor completely.

8. $x + 3; \; x^3 + 4x^2 + x - 6$
9. $x - 4; \; x^3 + 4x^2 - 17x - 60$

#s 10,11 Determine if the given number is a zero of the given polynomial.

10. $3; \; f(x) = 2x^3 - 5x^2 - 4x - 3$
11. $-2; \; g(d) = d^3 + 2d^2 + 3d + 1$

#s 12, 13 Find all *possible* rational zeros, with Rational Zeros Theorem. Then stop.

12. $f(x) = x^3 - 9x^2 + 26x - 24$
13. $h(x) = x^3 - x^2 - 7x + 15$

#s 14 – 19 Find all real and nonreal zeros. Write the polynomial in factored form. Some of these will stretch your notion of what 'factored' means, even beyond 3.2. You're already started on #14 and 15, with #12 and 13.

14. $f(x) = x^3 - 9x^2 + 26x - 24$
15. $h(x) = x^3 - x^2 - 7x + 15$
16. $m(x) = x^3 + 4x^2 + 4x + 3$
17. $M(t) = 18t^3 - 21t^2 + 10t - 2$
18. $V(x) = x^4 + 2x^3 - x^2 - 4x - 2$
19. $f(x) = (x^2 - 4x + 1)(x^3 - 9x^2 + 23x - 15)$

#s 20 – 22 Use division to write the rational function $\left(\text{which is in the form } \frac{\text{Dividend}}{\text{Divisor}}\right)$ in the form $\text{Quotient} + \frac{\text{Remainder}}{\text{Divisor}}$.

20. $f(x) = \frac{2x+1}{x-2}$

21. $f(a) = \frac{a^2 - 3a + 5}{a-3}$

22. $f(c) = \frac{c^2 - 3c - 4}{c^2 - 4}$