Divide using long division. State the quotient, $q(x)$, and the remainder, $r(x)$.

1. $(x^3 + 5x^2 + 7x + 2) \div (x + 2)$ $q(x):$ _____ $r(x):$ _____

2. $(6x^3 + 7x^2 + 12x - 5) \div (3x - 1)$ $q(x):$ _____ $r(x):$ _____

3. $\dfrac{4x^4 - 4x^2 + 6x}{x - 4}$
$\qquad$
$q(x) :$ _____
$\qquad$
$r(x) :$ _____

Divide using synthetic division.

4. $(2x^2 + x - 10) \div (x - 2)$

5. $(3x^2 + 7x - 20) \div (x + 5)$

6. $(6x^5 - 2x^3 + 4x^2 - 3x + 1) \div (x - 2)$

7. $(x^2 - 5x - 5x^3 + x^4) \div (5 + x)$

8. $\dfrac{x^5 + x^3 - 2}{x - 1}$

Use synthetic division and the Remainder Theorem to find the indicated function value.

9. $f(x) = 2x^3 - 11x^2 + 7x - 5;\quad f(4)$

10. $f(x) = 2x^4 - 5x^3 - x^2 + 3x + 2;\quad f\left(-\dfrac{1}{2}\right)$

11. Use synthetic division to divide and use the result to find the remaining zeros of $f(x)$.

$f(x) = x^3 - 4x^2 + x + 6$ divided by $x + 1$

12. Solve the equation $f(x) = 2x^3 - 5x^2 + x + 2 = 0$ given that 2 is a zero of $f(x)$.

13. Solve the equation $f(x) = 12x^3 + 16x^2 - 5x - 3 = 0$ given that $-\dfrac{3}{2}$ is a zero of $f(x)$.