## 7.4 Exercises

### Exercise 7.1

Divide by long division.

a) $\frac{x^3-4x^2+2x+1}{x-2}$ b) $\frac{x^3+6x^2+7x-2}{x+3}$ c) $\frac{x^2+7x-4}{x+1}$

d) $\frac{x^3+3x^2+2x+5}{x+2}$ e) $\frac{2x^3+x^2+3x+5}{x-1}$ f) $\frac{2x^4+7x^3+x+3}{x+5}$

g) $\frac{2x^4-31x^2-13}{x-4}$ h) $\frac{x^3+27}{x+3}$ i) $\frac{3x^4+7x^3+5x^2+7x+4}{3x+1}$

j) $\frac{8x^3+18x^2+21x+18}{2x+3}$ k) $\frac{x^3+3x^2-4x-5}{x^2+2x+1}$ l) $\frac{x^5+3x^4-20}{x^2+3}$

### Exercise 7.2

Find the remainder when dividing $f(x)$ by $g(x)$.

a) $f(x) = x^3 + 2x^2 + x - 3$, $g(x) = x - 2$
b) $f(x) = x^3 - 5x + 8$, $g(x) = x - 3$
c) $f(x) = x^5 - 1$, $g(x) = x + 1$
d) $f(x) = x^5 + 5x^2 - 7x + 10$, $g(x) = x + 2$

### Exercise 7.3

Determine whether the given $g(x)$ is a factor of $f(x)$. If so, name the corresponding root of $f(x)$.

a) $f(x) = x^2 + 5x + 6$, $g(x) = x + 3$
b) $f(x) = x^3 - x^2 - 3x + 8$, $g(x) = x - 4$
c) $f(x) = x^4 + 7x^3 + 3x^2 + 29x + 56$, $g(x) = x + 7$
d) $f(x) = x^{999} + 1$, $g(x) = x + 1$

## Exercise 7.4

Check that the given numbers for $x$ are roots of $f(x)$ (see Observation 7.10). If the numbers $x$ are indeed roots, then use this information to factor $f(x)$ as much as possible.

| | |
|---|---|
| a) $f(x) = x^3 - 2x^2 - x + 2$, | $x = 1$ |
| b) $f(x) = x^3 - 6x^2 + 11x - 6$, | $x = 1, x = 2, x = 3$ |
| c) $f(x) = x^3 - 3x^2 + x - 3$, | $x = 3$ |
| d) $f(x) = x^3 + 6x^2 + 12x + 8$, | $x = -2$ |
| e) $f(x) = x^3 + 13x^2 + 50x + 56$, | $x = -2, x = -4$ |
| f) $f(x) = x^3 + 3x^2 - 16x - 48$, | $x = 2, x = -4$ |
| g) $f(x) = x^5 + 5x^4 - 5x^3 - 25x^2 + 4x + 20$, | $x = 1, x = -1,$ $x = 2, x = -2$ |

## Exercise 7.5

Divide by using synthetic division.

a) $\frac{2x^3+3x^2-5x+7}{x-2}$ b) $\frac{4x^3+3x^2-15x+18}{x+3}$ c) $\frac{x^3+4x^2-3x+1}{x+2}$

d) $\frac{x^4+x^3+1}{x-1}$ e) $\frac{x^5+32}{x+2}$ f) $\frac{x^3+5x^2-3x-10}{x+5}$