28. Problems from the Textbook: 4, 5, 8, 10, 11, 14, 16, 22, 26, 34 (3.2); 2, 6, 8, 17, 21, 38, 43 (3.3); 2, 6, 8, 12, 16, 17, 19, 24, 27, 36 (3.4); 2,, 7, 8, 12, 14, 20, 23, 30, 34, 37, 40, 44, 48, 52, 55, 60 (3.5); 4, 6, 13, 17, 22, 24, 31, 32, 33, 38 (3.6); 4, 6, 7, 10, 15, 19 (3.7); 2, 7, 8, 9, 15, 19, 23, 26, 28, 31, 36, 37, 46, 51 (3.8).

29. Find the smallest and largest values of f on D:

    (a) $f(x) = |x-3|$, $D = [-4, 6]$;

    (b) $f(x) = |x^3 - x^2 - x - 1|$, $D = \mathbb{R}$;

    (c) $f(x) = \frac{9}{x} + x - 3$, $D = [1, 9]$;

    (d) $f(x) = \frac{x^2-1}{x^2+1}$, $D = [-1, 1]$;

    (e) $f(x) = \sqrt{x}\sqrt[4]{1-x^2}$, $D = [-1, 1]$;

    (f) $f(x) = (x^2-4)^5(x+1)^6$, $D = \mathbb{R}$;

    (g) $f(x) = \begin{cases} |x-3|+2 & \text{for } x \le 4 \\ x^2 - 10x + 27 & \text{for } x > 4 \end{cases}$, $D = [\frac{5}{2}, 6]$.

30. For each of the functions $f(x) = x^3 - 3x - 4$, $f(x) = 1 + 2x + \frac{18}{x}$, $f(x) = \frac{x^2}{x-3}$, $f(x) = (x^3 + 3x^2)^3$, $f(x) = x + \cos(2x)$, do the following:

    (a) Find f' and f'' as well as their zeros.

    (b) Give all intervals where f is increasing and decreasing, resp., and determine all local extrema.

    (c) Give all intervals where f is concave upwards and downwards, resp., and determine all inflection points.

    (d) Find the y- and x-intercepts of f and sketch the graph of f (for the last one between 0 and π, for all others between -4 and 4).

31. For $f(x) = x^2 - 4ax + 3a^2$ (with $a > 0$) and $f(x) = \frac{x^2-1}{x^2-a^2}$ (with $a > 1$), do the following:

    (a) Find $f'(x)$ and its zeros and sketch the graph of f'.

    (b) Find $f''(x)$ and its zeros and sketch the graph of f''.

    (c) Determine the zeros of f and sketch the graph of f.

32. Find a cubic polynomial with a local maximum at $(-1, \frac{4}{3})$ and a local minimum at $(1, 0)$.

33. Suppose the stripe between $y = 0$ and $y = 1$ is a river and a person P is at the point $(0, 1)$ trying to go to $(1, 0)$. P first rows by a boat (with 6 units an hour) to the point $(p, 0)$ and then runs (with 10 units an hour) to $(1, 0)$.

    (a) Draw a picture of the scene.

    (b) Describe the travel time as a function of p.

    (c) Where should p be so the travel time is minimal?

    (d) What is the minimal travel time in minutes?

    (e) What is the longest possible travel time in minutes, provided P doesn't leave the unit square?