34. Problems from the Textbook: 2, 5, 12, 19 (3.9); 1, 5, 9, 13, 17, 21, 29, 37, 40, 50, 55, 60 (3.10); 3, 6, 9, 10 (3.AP); 1, 5, 9, 10, 11, 13, 16, 20, 27, 31, 41, 43, 45 (4.1); 1, 3, 4, 10, 11, 13, 15, 20, 21, 23, 24 (4.2); 1, 5, 7, 8, 11, 13, 17, 23, 26, 27, 29, 32, 33, 35, 38, 51, 52, 55, 57, 59, 74 (4.3).

35. Let $f(x) = \frac{x^2-x-2}{x-3}$.
    (a) Find the domain and the zeros of f.
    (b) Find f' and f''.
    (c) Determine all local extrema and inflection points of f.
    (d) Give a line $l(x) = ax + b$ such that $\lim_{x\to\infty}(f(x) - l(x)) = 0$.
    (e) Draw the graph of f.

36. For the following functions f, find F with $F' = f$ and $F(1) = 5$:
    (a) $f(x) = x^2$;
    (b) $f(x) = 4x^6 + 2x^3$;
    (c) $f(x) = 0$;
    (d) $f(x) = \frac{8}{x^2}$;
    (e) $f(x) = \sqrt{x} + x$;
    (f) $f(x) = \sin x$.

37. Find the following sums:
    (a) $\sum_{k=1}^{9}(-1)^k$;
    (b) $\sum_{k=1}^{4}\frac{4k}{k+1}$;
    (c) $\sum_{k=0}^{20}\left(5^k - 5\cdot 5^k\right)$;
    (d) $\sum_{k=2}^{70}\left(\frac{1}{\sqrt{k+8}} - \frac{1}{\sqrt{k+9}}\right)$;
    (e) $\sum_{k=1}^{20}\frac{\sqrt{k+1}-\sqrt{k}}{\sqrt{k^2+k}}$;
    (f) $\sum_{k=1}^{15}\frac{1}{k^2+k}$.

38. Prove the following formulae using mathematical induction:
    (a) $\sum_{k=0}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$;
    (b) $\sum_{k=0}^{n} k^3 = \frac{n^2(n+1)^2}{4}$;
    (c) $\sum_{k=0}^{n} 2^k = 2^{(n+1)} - 1$.

39. Determine the area of the region under the curve f over the interval $I = [a, b]$, where $a, b > 0$, $a < b$, for each of the following functions f. Use the definition involving limits of sums as well as the formulae from the preceding problem.
    (a) $f(x) = 1$;
    (b) $f(x) = x$;
    (c) $f(x) = x^2$;
    (d) $f(x) = x^3$;
    (e) $f(x) = \alpha x + \beta$, where $\alpha, \beta \in \mathbb{R}$.