(1)

Задание1

> $f := (x, n) \rightarrow \frac{2n-5}{n+7} \cdot \frac{1}{(3 \cdot x^2 - 4x + 2)^n}$:

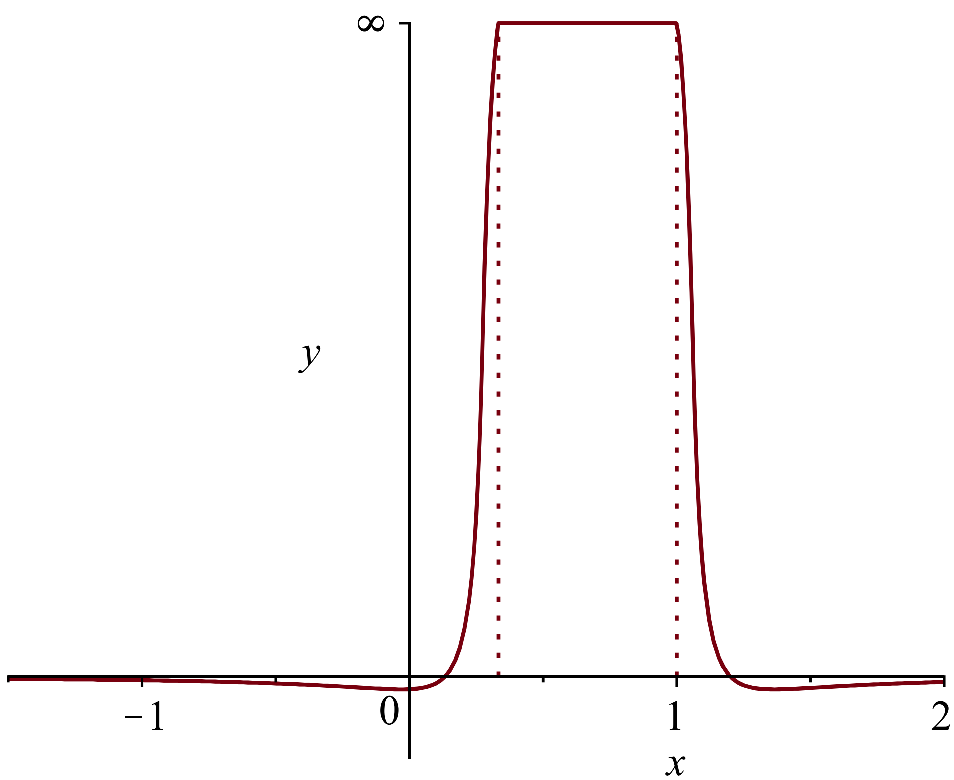
$Limit\left(\frac{f(x, n+1)}{f(x, n)}, n = \text{infinity}\right) = limit\left(\frac{f(x, n+1)}{f(x, n)}, n = \text{infinity}\right);$

$$\lim_{n \to \infty} \frac{(2n-3)(n+7)(3x^2-4x+2)^n}{(n+8)(3x^2-4x+2)^{n+1}(2n-5)} = \frac{1}{3x^2-4x+2} \quad (2)$$

> $solve\left(\left|\frac{1}{3x^2-4x+2}\right| < 1\right);$

$$\left(-\infty, \frac{1}{3}\right), (1, \infty) \quad (3)$$

> $y1 := plot(sum(f(x, n), n = 1..10000), x = -1.5..2, y = -1..\text{infinity})$:
$y2 := plot\left(\left[\frac{1}{3}, t, t = 0..\text{infinity}\right], x = -1.5..2, y = -1..\text{infinity}, linestyle = 2\right)$:
$y3 := plot([1, t, t = 0..\text{infinity}], x = -1.5..2, y = -1..\text{infinity}, linestyle = 2)$:
$plots[display]([y1, y2, y3]);$



Задание 2.

> $f := (x, n) \rightarrow \frac{x^n}{7n-10}$:

$Limit(f(x, n), n = \text{infinity}) = limit(f(x, n), n = \text{infinity})$ assuming $0 \le x \le 1$;

$Limit\left(\frac{f(x, n+1)}{f(x, n)}, n = \text{infinity}\right) = limit(f(x, n), n = \text{infinity})$ assuming $0 \le x \le 1$;

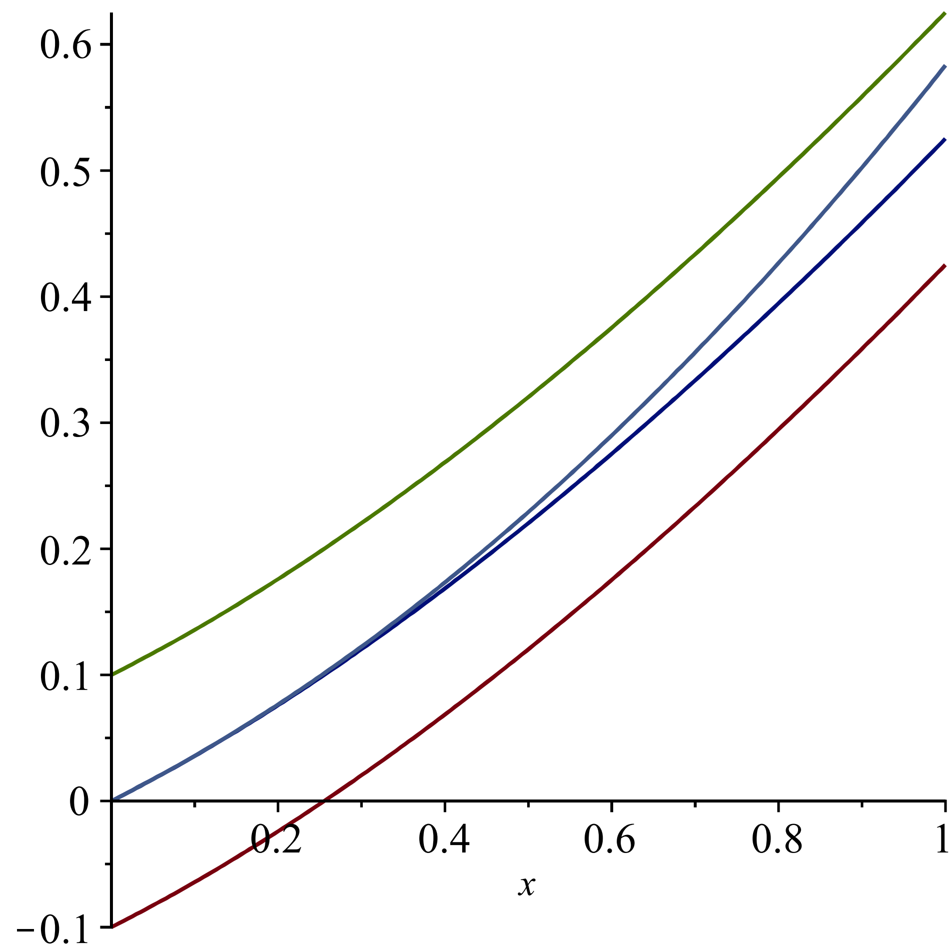
$$\lim_{n \to \infty} \frac{x^n}{7n-10} = 0$$

$$\lim_{n \to \infty} \frac{x^{n+1}(7n-10)}{(7n-3)x^n} = 0 \qquad \textbf{(4)}$$

> $solve\left(\frac{1}{7n-3} < 0.1, n\right);$
$n_{min} = 2;$
$y1 := sum\left((-1)^n \frac{x^n}{7n-10}, n = 1 .. \text{infinity}\right):$
$y2 := sum\left((-1)^n \frac{x^n}{7n-10}, n = 1 ..2\right):$
$plot([y1 - 0.1, y1, y1 + 0.1, y2], x = 0 ..1);$

$$(-\infty, 0.4285714286), (1.857142857, \infty)$$

$$n_{min} = 2$$



Задание 3.

> $f := x \to \cos(4x^2):$
$f(x) = taylor(f(x), x = 0, 20);$
$Int(f(x), x = 0 ..0.5) = evalf(int(f(x), x = 0 ..0.5), 3);$

$$\cos(4x^2) = 1 - 8x^4 + \frac{32}{3}x^8 - \frac{256}{45}x^{12} + \frac{512}{315}x^{16} + O(x^{20})$$

$$\int_0^{0.5} \cos(4x^2)\,dx = 0.452 \tag{5}$$

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> f := n -> (-1)^n / (2·(2 n)!(4 n + 1)) :
  f(n + 1) := f(n + 1);
  n > fsolve(|(-1)^(n + 1) / (2 (2 n + 2)! (4 n + 5))| = 0.001, n);
  Sum(f(n), n = 0 ..2) = evalf(sum(f(n), n = 0 ..2), 3);
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$$f(n+1) := \frac{(-1)^{n+1}}{2\,(2n+2)!\,(4n+5)}$$

$$1.237344088 < n$$

$$\sum_{n=0}^{2} \frac{(-1)^n}{2\,(2n)!\,(4n+1)} = 0.452 \tag{6}$$

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