ДЗ 2. Моисеев Тип 12.

№1) $f(x) = \cos 3x \cdot (2x^3 - x + 1)$

$$f^{(24)}(x) = \sum_{k=0}^{24} C_{24}^{k} (2x^3 - x + 1)^{(k)} \cos 3x^{(n-k)} = C_{24}^{0} (2x^3 - x + 1) \cos 3x^{(24)} +$$

$$+ C_{24}^{1} (6x^2 - 1) \cos 3x^{(23)} + C_{24}^{2} (12x) \cos 3x^{(22)} + C_{24}^{3} (12) \cos 3x^{(21)} + 0 \ldots + 0 =$$

$$\cos 3x' = -3 \sin 3x = 3 \cos\left(3x + \frac{\pi}{2}\right)$$

$$\cos 3x'' = -9 \cos 3x = -3 \cos\left(3x + \frac{2\pi}{2}\right)$$

$$\cos 3x''' = 27 \sin 3x = 27 \cos\left(3x + \frac{3\pi}{2}\right)$$

$$\cos 3x^{(n)} = \left(\cos 3x + \frac{n\pi}{2}\right) \cdot 3^n$$

$$= (2x^3 - x + 1) \cos\left(3x + \frac{24\pi}{2}\right) 3^{24} + 24 (6x^2 - 1) \cos\left(3x + \frac{23\pi}{2}\right) 3^{23} + 276 \cdot 12x \cdot \cos\left(3x + \frac{22\pi}{2}\right) +$$

$$\cdot 3^{22} + 2024 \cdot 12 \cos\left(3x + \frac{21\pi}{2}\right) \cdot 3^{21} = 3^{24} (2x^3 - x + 1) \cos 3x \cdot \ldots + 24 (6x^2 - 1) \sin 3x \cdot 3^{23}$$

$$- 3^{24} \cdot 3204 x \cos 3x - 24288 \sin 3x \cdot 3^{21} \#.$$

Соответствует ответу в Matlab.

№5. $\lim\limits_{x\to\infty} x \sin\frac{a}{x} = [\infty \cdot 0] = \lim\limits_{x\to\infty} \frac{\sin\frac{a}{x}}{\frac{1}{x}} = \left[\frac{0}{0}\right] \overset{\text{L'H}}{=} \lim\limits_{x\to\infty} \frac{a\sin\frac{a}{x}}{\frac{a}{x}} = \lim\limits_{x\to\infty} a = a.$

$= \lim\limits_{x\to\infty} \frac{-\frac{a}{x^2}\cos\frac{a}{x}}{-\frac{1}{x^2}} = \lim\limits_{x\to\infty} a\cos\frac{a}{x} = a.$