$y' = 2\cos(2x+6)\cdot(-\sin(2x+6))\cdot 2 = -4\cos(2x+6)\sin(2x+6) =$

$= -2\sin(4x+12)$

$y'(-4) = -2\sin(-4) = 2\sin 4$

$y'' = -2\cos(4x+12)\cdot 4 = -8\cos(4x+12)$

$y''(-4) = -8\cos 4$

$y''' = -8\cdot 4\cdot(-\sin(4x+12)) = 32\sin(4x+12)$

$y'''(-4) = -32\sin 4$

$y^{IV} = 32\cdot 4\cos(4x+12) = 128\cos(4x+12)$

$y^{IV}(-4) = 128\cos 4$

$y^{V} = 128\cdot 4\cdot(-\sin(4x+12)) = -512\sin(4x+12)$

$y^{V}(-4) = 512\sin 4.$

$\Rightarrow y \sim \cos^2 2 + 2\sin 4\cdot(x+4) - 4\cos 4\cdot(x+4)^2 - \frac{32}{6}\cdot(x+4)^3 +$

$+ \frac{128}{24}\cos 4\cdot(x+4)^4 + \frac{512}{120}\cdot\sin 4\cdot(x+4)^5 + o((x+4)^5).$

№19

а) $\lim\limits_{x\to 0}\frac{2-\cos x - e^{x^2}}{x-\ln(1+x)} = \lim\limits_{x\to 0}\frac{F(x)}{G(x)} = L$

$\cos x \sim 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \ldots$

$e^{x^2} \sim 1 + x^2 + \frac{x^4}{2!} + \ldots \Rightarrow F(x) \sim -\frac{1}{2}x^2 + o(x^2)$

$\ln(1+x) \sim x - \frac{x^2}{2} + \frac{x^3}{3} + \ldots \Rightarrow G(x) \sim \frac{1}{2}x^2 + o(x^2)$

$\Rightarrow L = \lim\limits_{x\to 0}\frac{-\frac{1}{2}x^2 + o(x^2)}{\frac{1}{2}x^2 + o(x^2)} = -1.$

б) $\lim\limits_{x\to 0}\frac{e^x + e^{2x} - 2\cos x - 3\sin x}{\sqrt{1+2x} + \sqrt[3]{1-3x} - 2\cos x} = \lim\frac{F(x)}{G(x)} = L$

$e^x \sim 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots$

$e^{2x} \sim 1 + 2x + \frac{4x^2}{2!} + \frac{8x^3}{3!} + \ldots$

$\cos x \sim 1 - \frac{x^2}{2!} + \frac{x^4}{4!} + \ldots$

$\sin x \sim x - \frac{x^3}{3!} + \frac{x^5}{5!} + \ldots$

$\Rightarrow F(x) \sim (1+1-2) + (1+2-3)x + \left(\frac{1}{2} + 2 - 1\right)x^2 + \ldots =$

$= \frac{3}{2}x^2 + o(x^2)$