вариант 6

№ 1

а) $\lim\limits_{x\to\infty}\left(\frac{2x+1}{(x+1)^2}\cdot\frac{x^2+1}{x-2}\right)=\lim\limits_{x\to\infty}\frac{\cancel{x^3}(2+\overset{\to 2}{\frac{1}{x}})(1+\overset{\to 1}{\frac{1}{x^2}})}{\cancel{x^3}(\underset{\to 1}{1+\frac{1}{x}})^2(\underset{\to 1}{1-\frac{2}{x}})^2}=$

$=2$

б) $\lim\limits_{x\to\infty}\operatorname{arctg}\left(\frac{x^2+2}{x-x^2}\right)=\operatorname{arctg}\left(\lim\limits_{x\to\infty}\frac{x^2+2}{x-x^2}\right)=$

$=\operatorname{arctg}\left(\lim\limits_{x\to\infty}\frac{\cancel{x^2}(\overset{\to 1}{1+\frac{2}{x^2}})}{\cancel{x^2}(\underset{\to -1}{\frac{1}{x}-1})}\right)=\operatorname{arctg}(-1)=-\frac{\pi}{4}$

в) $\lim\limits_{x\to -3}\frac{4x^2+11x-3}{3x^2+14x+15}=\left[\frac{36-33-3}{27-42+15}=\frac{0}{0}\right]=$

$=\lim\limits_{x\to -3}\frac{\cancel{(x+3)}(4x-1)}{\cancel{(x+3)}(3x+5)}=\left[\frac{-12-1}{-9+5}=\frac{-13}{-4}\right]=\frac{13}{4}$

г) $\lim\limits_{x\to 1}\frac{\sqrt{2x+2}-2}{1-\sqrt{x}}=\left[\frac{\sqrt{4}-2}{1-1}=\frac{0}{0}\right]=$

$=\lim\limits_{x\to 1}\frac{(\sqrt{2x+2}-2)(\sqrt{2x+2}+2)(1+\sqrt{x})}{(\sqrt{2x+2}+2)(1-\sqrt{x})(1+\sqrt{x})}=$

$=\lim\limits_{x\to 1}\frac{(2x-2)(1+\sqrt{x})}{(\sqrt{2x+2}+2)(1-x)}=\lim\limits_{x\to 1}\frac{2\cancel{(x-1)}(1+\sqrt{x})}{-\cancel{(x-1)}(\sqrt{2x+2}+2)}=$

$=\lim\limits_{x\to 1}\frac{-2(1+\sqrt{x})}{\sqrt{2x+2}+2}=\left[\frac{-2(1+1)}{\sqrt{4}+2}=\frac{-4}{4}\right]=-1.$

д) $\lim\limits_{x\to 0} \dfrac{\operatorname{tg} x - \sin x}{x^3} = \left[\dfrac{0}{0}\right] =$

$= \lim\limits_{x\to 0} \dfrac{\dfrac{\sin x}{\cos x} - \sin x}{x^3} = \lim\limits_{x\to 0} \dfrac{\sin x\,(1-\cos x)}{x^3\cdot\cos x} =$

$= \lim\limits_{x\to 0} \dfrac{\sin x\cdot 2\sin^2\frac{x}{2}}{x^3\cdot\cos x} = \lim\limits_{x\to 0} \dfrac{\overbrace{\sin x}^{\to 1}\cdot 2\,\overbrace{\sin^2\frac{x}{2}}^{\to 1}}{x\cdot 4\cdot\left(\frac{x}{2}\right)^2\cdot\underbrace{\cos x}_{\to 1}} =$

$= \dfrac{1}{2}.$

е) $\lim\limits_{x\to\infty} \left(\dfrac{x+5}{x-2}\right)^{2x} = \left[1^\infty\right] =$

$= \lim\limits_{x\to\infty} \Bigg[\underbrace{\left(1+\dfrac{7}{x-2}\right)^{\frac{x-2}{7}}}_{\to e}\Bigg]^{\frac{7}{x-2}\cdot 2x} =$

$= \lim\limits_{x\to\infty} e^{\frac{14x}{x-2}} = e^{14}.$