GIỚI HẠN KHI x TIẾN TỚI VÔ CỰC

Câu 1: Tìm các giới hạn sau:

a). $\lim\limits_{x\to-\infty}\frac{3x^2-x+7}{2x^3-1}$ b). $\lim\limits_{x\to+\infty}\frac{(4x^2+1)(7x-1)}{(2x^3-1)(x+3)}$ c). $\lim\limits_{x\to+\infty}\frac{x\sqrt{x}+3}{x^2-x+2}$

d). $\lim\limits_{x\to+\infty}\left[(x+1)\sqrt{\frac{x}{2x^4+x^2+1}}\right]$ e). $\lim\limits_{x\to-\infty}x\sqrt{\frac{2x^3+x}{x^5-x^2+3}}$.

LỜI GIẢI

a). $\lim\limits_{x\to-\infty}\frac{3x^2-x+7}{2x^3-1}=\lim\limits_{x\to-\infty}\frac{x^2\left(3-\frac{1}{x}+\frac{7}{x^2}\right)}{x^3\left(2-\frac{1}{x^3}\right)}=\lim\limits_{x\to-\infty}\frac{3-\frac{1}{x}+\frac{7}{x^2}}{x\left(2-\frac{1}{x^3}\right)}=\lim\limits_{x\to-\infty}\frac{3}{2x}=0$

b). $\lim\limits_{x\to+\infty}\frac{(4x^2+1)(7x-1)}{(2x^3-1)(x+3)}=\lim\limits_{x\to+\infty}\frac{x^2\left(4+\frac{1}{x^2}\right)x\left(7-\frac{1}{x}\right)}{x^3\left(2-\frac{1}{x^3}\right)x\left(1+\frac{3}{x}\right)}=\lim\limits_{x\to+\infty}\frac{\left(4+\frac{1}{x^2}\right)\left(7-\frac{1}{x}\right)}{x\left(2-\frac{1}{x^3}\right)\left(1+\frac{3}{x}\right)}=\lim\limits_{x\to+\infty}\frac{28}{2x}=0$

c). $\lim\limits_{x\to+\infty}\frac{x\sqrt{x}+3}{x^2-x+2}=\lim\limits_{x\to+\infty}\frac{x\sqrt{x}\left(1+\frac{3}{x\sqrt{x}}\right)}{x^2\left(1-\frac{1}{x}+\frac{2}{x^2}\right)}=\lim\limits_{x\to+\infty}\frac{1+\frac{3}{x\sqrt{x}}}{\sqrt{x}\left(1-\frac{1}{x}+\frac{2}{x^2}\right)}=\lim\limits_{x\to+\infty}\frac{1}{\sqrt{x}}=0$.

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

$=\lim\limits_{x\to+\infty}\left[(x+1)\sqrt{\frac{1}{2x^3}}\right]=\lim\limits_{x\to+\infty}\left[(x+1)\frac{1}{x\sqrt{x}\sqrt{2}}\right]=\lim\limits_{x\to+\infty}\left[x\left(1+\frac{1}{x}\right)\frac{1}{x\sqrt{x}\sqrt{2}}\right]=0$

e). $\lim\limits_{x\to-\infty}x\sqrt{\frac{2x^3+x}{x^5-x^2+3}}=\lim\limits_{x\to-\infty}x\sqrt{\frac{x^3\left(x+\frac{1}{x^2}\right)}{x^5\left(1-\frac{1}{x^3}+\frac{3}{x^5}\right)}}=\lim\limits_{x\to-\infty}x\frac{\sqrt{2}}{\sqrt{x^2}}=\lim\limits_{x\to-\infty}x\frac{\sqrt{2}}{|x|}=\lim\limits_{x\to-\infty}x\frac{\sqrt{2}}{-x}=-\sqrt{2}$

Câu 2: Tìm các giới hạn sau:

a). $\lim\limits_{x\to-\infty}\left(\sqrt{2x^2+1}+x\right)$ b). $\lim\limits_{x\to+\infty}\frac{3x^2-x+3}{x-4}$ c). $\lim\limits_{x\to+\infty}\frac{x^4-x^3+11}{2x-7}$

d). $\lim\limits_{x\to+\infty}\frac{\sqrt{2x^4+x^2-1}}{1-2x}$ e). $\lim\limits_{x\to+\infty}\frac{\sqrt{x^4-x}}{1-2x}$ f). $\lim\limits_{x\to-\infty}\frac{2x^4+7x^3-15}{x^4+1}$.

LỜI GIẢI

a). $\lim\limits_{x\to-\infty}\left(\sqrt{2x^2+1}+x\right)=\lim\limits_{x\to-\infty}\left(\sqrt{x^2\left(2+\frac{1}{x^2}\right)}+x\right)=\lim\limits_{x\to-\infty}\left(\sqrt{2x^2}+x\right)$

$=\lim\limits_{x\to\infty}\left(|x|\sqrt{2}+x\right)=\lim\limits_{x\to-\infty}\left(-\sqrt{2}x+x\right)=\lim\limits_{x\to-\infty}x\left(-\sqrt{2}+1\right)=+\infty$

b). $\lim_{x\to+\infty}\frac{3x^2-x+3}{x-4}=\lim_{x\to+\infty}\frac{x^2\left(3-\frac{1}{x}+\frac{3}{x^2}\right)}{x\left(1-\frac{1}{x}\right)}=\lim_{x\to+\infty}3x=+\infty$

c). $\lim_{x\to+\infty}\frac{x^4-x^3+11}{2x-7}=\lim_{x\to+\infty}\frac{x^4\left(1-\frac{1}{x}+\frac{11}{x^3}\right)}{x\left(2-\frac{7}{x}\right)}=\lim_{x\to+\infty}\frac{1}{2}x^3=+\infty$

d). $\lim_{x\to+\infty}\frac{\sqrt{2x^4+x^2-1}}{1-2x}=\lim_{x\to+\infty}\frac{\sqrt{x^4\left(2+\frac{1}{x^2}-\frac{1}{x^4}\right)}}{x\left(\frac{1}{x}-2\right)}=\lim_{x\to+\infty}\frac{x\sqrt{2+\frac{1}{x^2}-\frac{1}{x^4}}}{\frac{1}{x}-2}=\lim_{x\to+\infty}\frac{\sqrt{2}x}{-2}=-\infty$

e). $\lim_{x\to+\infty}\frac{\sqrt{x^4-x}}{1-2x}=\lim_{x\to+\infty}\frac{\sqrt{x^4\left(1-\frac{1}{x^3}\right)}}{x\left(\frac{1}{x}-2\right)}=\lim_{x\to+\infty}\frac{x\sqrt{1-\frac{1}{x^3}}}{\frac{1}{x}-2}=+\infty$

f). $\lim_{x\to-\infty}\frac{2x^4+7x^3-15}{x^4+1}=\lim_{x\to-\infty}\frac{x^4\left(2+\frac{7}{x}-\frac{15}{x^3}\right)}{x^4\left(1+\frac{1}{x^4}\right)}=2$

Câu 3: Tìm các giới hạn sau:

a). $\lim_{x\to-\infty}\frac{(x-1)^2(5x+2)^2}{(3x+1)^4}$ b). $\lim_{x\to-\infty}\frac{2|x|+3}{\sqrt{x^2+x+5}}$ c). $\lim_{x\to-\infty}\frac{2|x|+3}{\sqrt{x^2+x+5}}$

d). $\lim_{x\to+\infty}\sqrt{\frac{2x^5+x^3-1}{(2x^2-1)(x^3+x)}}$ e). $\lim_{x\to-\infty}\frac{\sqrt{x^2+x}+2x}{2x+3}$ f). $\lim_{x\to-\infty}\frac{|x|-\sqrt{x^2+x}}{x+10}$

LỜI GIẢI

a). $\lim_{x\to-\infty}\frac{(x-1)^2(5x+2)^2}{(3x+1)^4}=\lim_{x\to-\infty}\frac{x^2\left(1-\frac{1}{x}\right)^2x^2\left(5+\frac{2}{x}\right)^2}{x^4\left(3+\frac{1}{x}\right)^4}=\lim_{x\to-\infty}\frac{\left(1-\frac{1}{x}\right)^2\left(5+\frac{2}{x}\right)^2}{\left(3+\frac{1}{x}\right)^4}=\frac{25}{81}$

b). $\lim_{x\to+\infty}\frac{\sqrt{x^6+2}}{3x^3-1}=\lim_{x\to+\infty}\frac{\sqrt{x^6\left(1+\frac{2}{x^6}\right)}}{x^3\left(3-\frac{1}{x^3}\right)}=\lim_{x\to+\infty}\frac{x^3\sqrt{1+\frac{2}{x^3}}}{x^3\left(3-\frac{1}{x^3}\right)}=\lim_{x\to+\infty}\frac{\sqrt{\left(1+\frac{2}{x^3}\right)}}{3-\frac{1}{x^3}}=\frac{1}{3}$

c). $\lim_{x\to-\infty}\frac{2|x|+3}{\sqrt{x^2+x+5}}=\lim_{x\to-\infty}\frac{-2x+3}{\sqrt{x^2\left(1+\frac{1}{x}+\frac{5}{x^2}\right)}}=\lim_{x\to-\infty}\frac{x\left(-2+\frac{3}{x}\right)}{x\sqrt{1+\frac{1}{x}+\frac{5}{x^2}}}=\lim_{x\to-\infty}\frac{-2+\frac{3}{x}}{1+\frac{1}{x}+\frac{5}{x^2}}=-2$

d). $\lim\limits_{x\to+\infty}\sqrt{\dfrac{2x^5+x^3-1}{(2x^2-1)(x^3+x)}}=\lim\limits_{x\to+\infty}\dfrac{x^5\left(2+\dfrac{1}{x^2}-\dfrac{1}{x^5}\right)}{x^2\left(2-\dfrac{1}{x^2}\right)x^3\left(1+\dfrac{1}{x^2}\right)}=\lim\limits_{x\to+\infty}\dfrac{2+\dfrac{1}{x^2}-\dfrac{1}{x^3}}{\left(2-\dfrac{1}{x^2}\right)\left(1+\dfrac{1}{x^2}\right)}=1$

e). $\lim\limits_{x\to-\infty}\dfrac{\sqrt{x^2+x}+2x}{2x+3}=\lim\limits_{x\to-\infty}\dfrac{\sqrt{x^2\left(1+\dfrac{1}{x}\right)}+2x}{x\left(2+\dfrac{3}{x}\right)}=\lim\limits_{x\to-\infty}\dfrac{x\left(\sqrt{1+\dfrac{1}{x}}+2\right)}{x\left(2+\dfrac{3}{x}\right)}=\lim\limits_{x\to-\infty}\dfrac{\sqrt{1+\dfrac{1}{x}}+2}{2+\dfrac{3}{x}}=1$

f). $\lim\limits_{x\to-\infty}\dfrac{|x|-\sqrt{x^2+x}}{x+10}=\lim\limits_{x\to-\infty}\dfrac{-x-\sqrt{x^2\left(1+\dfrac{1}{x}\right)}}{x\left(1+\dfrac{10}{x}\right)}=\lim\limits_{x\to-\infty}\dfrac{-x\left(1+\sqrt{1+\dfrac{1}{x}}\right)}{x\left(1+\dfrac{10}{x}\right)}=\lim\limits_{x\to-\infty}\dfrac{1+\sqrt{1+\dfrac{1}{x}}}{1+\dfrac{10}{x}}=1$

Câu 4: Tìm các giới hạn sau:

a). $\lim\limits_{x\to-\infty}x\sqrt{\dfrac{2x^3+x}{x^5-x^2+3}}$ b). $\lim\limits_{x\to+\infty}\left[(x+2)\sqrt{\dfrac{x-1}{x^3+x}}\right]$ c). $\lim\limits_{x\to-\infty}\dfrac{\sqrt{x^2+2x+3}+4x+1}{\sqrt{4x^2+1}-x+2}$

d). $\lim\limits_{x\to+\infty}\left(\sqrt{x^2-4x}-x\right)$ e). $\lim\limits_{x\to-\infty}\left(\sqrt[3]{8x^3+1}-2x+1\right)$

LỜI GIẢI

a). $\lim\limits_{x\to-\infty}x\sqrt{\dfrac{2x^3+x}{x^5-x^2+3}}=\lim\limits_{x\to-\infty}x\sqrt{\dfrac{x^3\left(2+\dfrac{1}{x^2}\right)}{x^5\left(1-\dfrac{1}{x^3}+\dfrac{3}{x^5}\right)}}=\lim\limits_{x\to-\infty}x\dfrac{\sqrt{2+\dfrac{1}{x^2}}}{\sqrt{x^2}\sqrt{1-\dfrac{1}{x^3}+\dfrac{3}{x^5}}}$

$=\lim\limits_{x\to-\infty}\dfrac{\sqrt{2+\dfrac{1}{x^2}}}{\sqrt{1-\dfrac{1}{x^3}+\dfrac{3}{x^5}}}=\sqrt{2}$

b). $\lim\limits_{x\to+\infty}\left[(x+2)\sqrt{\dfrac{x-1}{x^3+x}}\right]=\lim\limits_{x\to+\infty}\left[x\left(1+\dfrac{2}{x}\right)\sqrt{\dfrac{x\left(1-\dfrac{1}{x}\right)}{x^3\left(1+\dfrac{1}{x^2}\right)}}\right]=\lim\limits_{x\to+\infty}\left[x\left(1+\dfrac{2}{x}\right)\dfrac{\sqrt{1-\dfrac{1}{x}}}{x\sqrt{1+\dfrac{1}{x^2}}}\right]$

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

c). $\lim\limits_{x\to-\infty}\dfrac{\sqrt{x^2+2x+3}+4x+1}{\sqrt{4x^2+1}-x+2}=\lim\limits_{x\to-\infty}\dfrac{\sqrt{x^2\left(1+\dfrac{2}{x}+\dfrac{3}{x^2}\right)}+4x+1}{\sqrt{x^2\left(4+\dfrac{1}{x^2}\right)}-x+2}=\lim\limits_{x\to-\infty}\dfrac{|x|\sqrt{\left(1+\dfrac{2}{x}+\dfrac{3}{x^2}\right)}+4x+1}{|x|\sqrt{4+\dfrac{1}{x^2}}-x+2}$

$$=\lim_{x\to-\infty}\frac{-x\sqrt{1+\frac{2}{x}+\frac{3}{x^2}}+4x+1}{-x\sqrt{4+\frac{1}{x^2}}-x+2}=\lim_{x\to-\infty}\frac{-x+4x+1}{-4x-x+2}=\lim_{x\to-\infty}\frac{-x\left(1-4-\frac{1}{x}\right)}{-x\left(4+1-\frac{2}{x}\right)}=\lim_{x\to-\infty}\frac{-3-\frac{1}{x}}{5-\frac{2}{x}}=\frac{-3}{5}$$

d). $\lim_{x\to+\infty}\left(\sqrt{x^2-4x}-x\right)=\lim_{x\to+\infty}\frac{x^2-4x-x}{\sqrt{x^2-4x}+x}=\lim_{x\to+\infty}\frac{-4x}{\sqrt{x^2\left(1-\frac{1}{x}\right)}+x}=\lim_{x\to+\infty}\frac{-4x}{x+x}=\lim_{x\to+\infty}\frac{-4x}{2x}=-2$

e). $\lim_{x\to-\infty}\left(\sqrt[3]{8x^3+1}-2x+1\right)=\lim_{x\to-\infty}\frac{8x^3+1-8x^3}{\left(\sqrt[3]{8x^3+1}\right)^2+\sqrt[3]{8x^3+1}.2x+4x^2}+1$

$$=\lim_{x\to-\infty}\frac{1}{\left(\sqrt[3]{x^3\left(8+\frac{1}{x^3}\right)}\right)^2+\sqrt[3]{x^3\left(8+\frac{1}{x^3}\right)}.2x+4x^2}+1$$

$$=\lim_{x\to-\infty}\frac{1}{4\left(\sqrt[3]{x^3}\right)^2+2\sqrt[3]{x^3}.2x+4x^2}+1=\lim_{x\to-\infty}\frac{1}{4x^2+4x^2+4x^2}+1=\lim_{x\to-\infty}\frac{1}{12x^2}+1=1$$

Câu 5: Tìm các giới hạn sau:

a). $\lim_{x\to+\infty}\left(\sqrt{x^2-4x}-x\right)$ b). $\lim_{x\to+\infty}\left(\sqrt{x^2+1}-x\right)$ c). $\lim_{x\to-\infty}\left(\sqrt{x^2-3x+2}+x\right)$

d). $\lim_{x\to-\infty}\left(\sqrt{4x^2-4x+1}+2x+3\right)$ e). $\lim_{x\to+\infty}\left(\sqrt{x^2-4x+1}-2x+3\right)$

LỜI GIẢI

a). $\lim_{x\to+\infty}\left(\sqrt{x^2-4x}-x\right)=\lim_{x\to+\infty}\frac{x^2-4x-x^2}{\sqrt{x^2-4x}+x}=\lim_{x\to+\infty}\frac{-4x}{\sqrt{x^2\left(1-\frac{4}{x}\right)}+x}=\lim_{x\to+\infty}\frac{-4x}{|x|+x}=\lim_{x\to+\infty}\frac{-4x}{2x}=-2$.

b). $\lim_{x\to+\infty}\left(\sqrt{x^2+1}-x\right)=\lim_{x\to+\infty}\frac{x^2+1-x^2}{\sqrt{x^2+1}+x}=\lim_{x\to+\infty}\frac{1}{\sqrt{x^2\left(1+\frac{1}{x^2}\right)}+x}=\lim_{x\to+\infty}\frac{1}{|x|+x}=\lim_{x\to+\infty}\frac{1}{2x}=0$.

c). $\lim_{x\to-\infty}\left(\sqrt{x^2-3x+2}+x\right)=\lim_{x\to-\infty}\frac{x^2-3x+2-x^2}{\sqrt{x^2-3x+2}+x}=\lim_{x\to-\infty}\frac{-3x+2}{\sqrt{x^2\left(1-\frac{3}{x}+\frac{2}{x^2}\right)}-x}$

$$=\lim_{x\to-\infty}\frac{-x\left(3+\frac{2}{x}\right)}{|x|-x}=\lim_{x\to-\infty}\frac{-3x}{-2x}=\frac{3}{2}.$$

d). $\lim_{x\to-\infty}\left(\sqrt{4x^2-4x+1}+2x+3\right)=\lim_{x\to-\infty}\left(\frac{4x^2-4x+1-4x^2}{\sqrt{4x^2-4x+1}-2x}\right)+3=\lim_{x\to-\infty}\frac{-4x+1}{\sqrt{x^2\left(4-\frac{4}{x}+\frac{1}{x}\right)}-2x}+3$

$$=\lim_{x\to-\infty}\frac{-x\left(4+\frac{1}{x}\right)}{2|x|-2x}+3=\lim_{x\to-\infty}\frac{-4x}{-2x}+3=2+3=5.$$

e). $\lim\limits_{x\to+\infty}\left(\sqrt{x^2-4x+1}-2x+3\right)=\lim\limits_{x\to+\infty}\frac{x^2-4x+1-4x^2}{\sqrt{x^2-4x+1}+2x}+3=\lim\limits_{x\to+\infty}\frac{-3x^2-4x+1}{\sqrt{x^2\left(1-\frac{4}{x}+\frac{1}{x^2}\right)}+2x}+3$

$=\lim\limits_{x\to+\infty}\frac{x^2\left(-3-\frac{4}{x}+\frac{1}{x^2}\right)}{|x|+2x}+3=\lim\limits_{x\to+\infty}\frac{-8x^2}{x+2x}+3=\lim\limits_{x\to+\infty}\frac{-8x^2}{3x}+3=\lim\limits_{x\to+\infty}(-3x)+3=-\infty$.

Câu 6: Tìm các giới hạn sau:

a). $\lim\limits_{x\to-\infty}\left(\sqrt{x^2-4x+3}-\sqrt{x^2-3x+2}\right)$ b). $\lim\limits_{x\to-\infty}\left(\sqrt{4x^2-9x-21}-\sqrt{4x^2-7x+13}\right)$

c). $\lim\limits_{x\to-\infty}\left(\frac{x^3}{3x^2-4}-\frac{x^2}{3x+2}\right)$

LỜI GIẢI

a). $\lim\limits_{x\to-\infty}\left(\sqrt{x^2-4x+3}-\sqrt{x^2-3x+2}\right)=\lim\limits_{x\to-\infty}\frac{x^2-4x+3-x^2+3x-2}{\sqrt{x^2-4x+3}+\sqrt{x^2-3x+2}}$

$=\lim\limits_{x\to-\infty}\frac{-x+1}{\sqrt{x^2\left(1-\frac{4}{x}+\frac{3}{x^2}\right)}+\sqrt{x^2\left(1-\frac{4}{x}+\frac{3}{x^2}\right)}}=\lim\limits_{x\to-\infty}\frac{-x+1}{\sqrt{x^2}\left(\sqrt{1-\frac{1}{x}+\frac{3}{x^2}}+\sqrt{1-\frac{4}{x}+\frac{3}{x^2}}\right)}$

$=\lim\limits_{x\to-\infty}\frac{-x\left(1-\frac{1}{x}\right)}{|x|\left(\sqrt{1-\frac{1}{x}+\frac{3}{x^2}}+\sqrt{1-\frac{4}{x}+\frac{3}{x^2}}\right)}=\lim\limits_{x\to-\infty}\frac{-x\left(1-\frac{1}{x}\right)}{-x\left(\sqrt{1-\frac{1}{x}+\frac{3}{x^2}}+\sqrt{1-\frac{4}{x}+\frac{3}{x^2}}\right)}=\frac{1}{2}$

b). $\lim\limits_{x\to-\infty}\left(\sqrt{4x^2-9x-21}-\sqrt{4x^2-7x+13}\right)=\lim\limits_{x\to-\infty}\frac{4x^2-9x-21-4x^2+7x-13}{\sqrt{4x^2-9x-21}+\sqrt{4x^2-7x+13}}$

$=\lim\limits_{x\to-\infty}\frac{-2x-34}{\sqrt{x^2\left(4-\frac{9}{x}-\frac{21}{x^2}\right)}+\sqrt{x^2\left(4-\frac{7}{x}+\frac{13}{x^2}\right)}}=\lim\limits_{x\to-\infty}\frac{-x\left(2+\frac{34}{x}\right)}{\sqrt{x^2}\left(\sqrt{4-\frac{9}{x}-\frac{21}{x^2}}+\sqrt{4-\frac{7}{x}+\frac{13}{x^2}}\right)}$

$=\lim\limits_{x\to-\infty}\frac{-x\left(2+\frac{34}{x}\right)}{|x|\left(\sqrt{4-\frac{9}{x}-\frac{21}{x^2}}+\sqrt{4-\frac{7}{x}+\frac{13}{x^2}}\right)}=\lim\limits_{x\to-\infty}\frac{-x\left(2+\frac{34}{x}\right)}{-x\left(\sqrt{4-\frac{9}{x}-\frac{21}{x^2}}+\sqrt{4-\frac{7}{x}+\frac{13}{x^2}}\right)}=\frac{1}{2}$

c). $L=\lim\limits_{x\to-\infty}\left(\frac{x^3}{3x^2-4}-\frac{x^2}{3x+2}\right)$

$$=\lim_{x\to-\infty}\frac{x^3}{3x^2-4}-\frac{x^2}{3x+2}=\lim_{x\to-\infty}\frac{x^3\left(3x+2\right)-x^2\left(3x^2-4\right)}{\left(3x^2-4\right)\left(3x+2\right)}=\lim_{x\to-\infty}\frac{2x^3+4x^2}{\left(3x^2-4\right)\left(3x+2\right)}$$

$$=\lim_{x\to-\infty}\frac{x^3\left(\frac{2x^3+4x^2}{x^3}\right)}{x^2\left(\frac{3x^2-4}{x^2}\right)x\left(\frac{3x+2}{x}\right)}=\lim_{x\to-\infty}\frac{2+\frac{4}{x}}{\left(3-\frac{4}{x^2}\right)\left(3+\frac{2}{x}\right)}.$$

Do $\lim\limits_{x\to-\infty}\frac{4}{x}=\lim\limits_{x\to-\infty}\frac{4}{x^2}=\lim\limits_{x\to-\infty}\frac{2}{x^2}=0$ nên $L=\frac{2}{3.3}=\frac{2}{9}$.