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

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

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

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

$$=\lim_{x\to+\infty} -3^{\frac{1}{x}}\frac{x}{x+2}\cdot\frac{\sqrt{1+\frac{1}{x+2}}-1}{-\frac{1}{x+2}}+\frac{3^{\frac{1}{x}}-1}{\frac{1}{x}}=$$

$$=-3^{0}\cdot 1\cdot\frac{1}{2}+\log 3=-\frac{1}{2}+\log 3$$

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