Limits of sequences

1. Find, exactly, the limits of the sequences below.

   (a) $\dfrac{7 + 1.9^n}{0.2^n - 3}$.

   (b) $3 + (\log_3 2)^n + (-e)^n$.

   (c) $\dfrac{\left(1 - \dfrac{1}{n}\right)^n}{2 + \sqrt[n]{0.7}}$.

   (d) $\left(1 + \dfrac{5}{n}\right)^n \cdot \sqrt{3 + \sqrt[n]{n}}$.

   (e) $\sqrt[n]{\pi} - \log_{0.4}(n^3 + 6n - 2)$.

   (f) $\dfrac{3}{\log\left(1 - \dfrac{1}{n}\right)}$.

   (g) $\dfrac{\left(5 + \dfrac{1}{\sqrt{n}}\right)^{\frac{1}{n^3}}}{6 + \ln n}$.

2. Find, exactly, the limits of the sequences below.

   (a) $\dfrac{2n^3 + \sqrt[5]{n^{17}} - n + 2}{4 + \sqrt{n^3}}$.

   (b) $\dfrac{\sqrt{2n^5 - n^4 + n^2 + 6} + 3n^2 - 1}{\sqrt[4]{3n^{10} + n^7 + 3} + n^2 - 1}$.

   (c) $\dfrac{3 \cdot 5^n + 3^n - 2}{2^n - 4^n - 7 \cdot 5^n}$.

   (d) $\dfrac{3 \cdot 2^n + 3^n - 2}{2^n - 4^n - 7 \cdot 5^n}$.

   (e) $\dfrac{3 \cdot 5^n + 3^n - 2}{2^n - 4^n - 7 \cdot 3^n}$.

   (f) $\dfrac{\sqrt{2 \cdot 4^n + 3^n + 1} + 2^n}{\sqrt[4]{16^n + 3} - 1}$.

   (g) $\dfrac{2^n + 1}{\sqrt{2 \cdot 3^n + 2^n + 5} + 4}$.

3. Using suitable theorems find, exactly, the limits of the sequences below.

   (a) $\sqrt[n]{5 \cdot n^6 + n^2 + 2}$.

   (b) $\sqrt[n]{\dfrac{1}{n^2} + \dfrac{2}{n} + \dfrac{4}{\sqrt{n}}}$.

   (c) $\sqrt[n]{3 \cdot 5^n - 2 \cdot 3^n + 4}$.

   (d) $\sqrt[n]{\dfrac{x^{2n+1}}{n \cdot 3^n + 1}}$, where $x > 0$.