# Projeto Mathematical Ramblings

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**Livro senos e cossenos explícitos**.

$$\sin \frac{\pi}{2} = 1$$

$$\cos \frac{\pi}{2} = 0$$

$$\sin \frac{\pi}{4} = \frac{1}{\sqrt{2}}$$

$$\cos \frac{\pi}{4} = \frac{1}{\sqrt{2}}$$

$$\sin \frac{\pi}{8} = \frac{\sqrt{\sqrt{2}-1}}{2^{\frac{3}{4}}}$$

$$\cos \frac{\pi}{8} = \frac{\sqrt{\sqrt{2}+1}}{2^{\frac{3}{4}}}$$

$$\sin \frac{\pi}{16} = \frac{\sqrt{2^{\frac{3}{4}}-\sqrt{\sqrt{2}+1}}}{2^{\frac{7}{8}}}$$

$$\cos \frac{\pi}{16} = \frac{\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}{2^{\frac{7}{8}}}$$

$$\sin \frac{\pi}{32} = \frac{\sqrt{2^{\frac{7}{8}}-\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}{2^{\frac{15}{16}}}$$

$$\cos \frac{\pi}{32} = \frac{\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}{2^{\frac{15}{16}}}$$

$$\sin \frac{\pi}{64} = \frac{\sqrt{2^{\frac{15}{16}}-\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}{2^{\frac{31}{32}}}$$

$$\cos \frac{\pi}{64} = \frac{\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}{2^{\frac{31}{32}}}$$

$$\sin \frac{\pi}{128} = \frac{\sqrt{2^{\frac{31}{32}}-\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}}{2^{\frac{63}{64}}}$$

$$\cos \frac{\pi}{128} = \frac{\sqrt{2^{\frac{31}{32}}+\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}}{2^{\frac{63}{64}}}$$

$$\sin \frac{\pi}{256} = \frac{\sqrt{2^{\frac{63}{64}}-\sqrt{2^{\frac{31}{32}}+\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}}}{2^{\frac{127}{128}}}$$

$$\cos \frac{\pi}{256} = \frac{\sqrt{2^{\frac{63}{64}}+\sqrt{2^{\frac{31}{32}}+\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}}}{2^{\frac{127}{128}}}$$

$$\sin \frac{\pi}{512} = \frac{\sqrt{2^{\frac{127}{128}}-\sqrt{2^{\frac{63}{64}}+\sqrt{2^{\frac{31}{32}}+\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}}}}{2^{\frac{255}{256}}}$$

$$\cos\frac{\pi}{512}=\frac{\sqrt{2^{\frac{127}{128}}+\sqrt{2^{\frac{63}{64}}+\sqrt{2^{\frac{31}{32}}+\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}}}}{2^{\frac{255}{256}}}$$

$$\sin\frac{\pi}{1024}=\frac{\sqrt{2^{\frac{255}{256}}-\sqrt{2^{\frac{127}{128}}+\sqrt{2^{\frac{63}{64}}+\sqrt{2^{\frac{31}{32}}+\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}}}}}{2^{\frac{511}{512}}}$$

$$\cos\frac{\pi}{1024}=\frac{\sqrt{2^{\frac{255}{256}}+\sqrt{2^{\frac{127}{128}}+\sqrt{2^{\frac{63}{64}}+\sqrt{2^{\frac{31}{32}}+\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}}}}}{2^{\frac{511}{512}}}$$

$$\sin\frac{\pi}{2048}=\frac{\sqrt{2^{\frac{511}{512}}-\sqrt{2^{\frac{255}{256}}+\sqrt{2^{\frac{127}{128}}+\sqrt{2^{\frac{63}{64}}+\sqrt{2^{\frac{31}{32}}+\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}}}}}{2^{\frac{1023}{1024}}}$$

$$\cos\frac{\pi}{2048}=\frac{\sqrt{2^{\frac{511}{512}}+\sqrt{2^{\frac{255}{256}}+\sqrt{2^{\frac{127}{128}}+\sqrt{2^{\frac{63}{64}}+\sqrt{2^{\frac{31}{32}}+\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}}}}}{2^{\frac{1023}{1024}}}$$

$$\sin\frac{\pi}{4096}=\frac{\sqrt{2^{\frac{1023}{1024}}-\sqrt{2^{\frac{511}{512}}+\sqrt{2^{\frac{255}{256}}+\sqrt{2^{\frac{127}{128}}+\sqrt{2^{\frac{63}{64}}+\sqrt{2^{\frac{31}{32}}+\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}}}}}}{2^{\frac{2047}{2048}}}$$

$$\cos\frac{\pi}{4096}=\frac{\sqrt{2^{\frac{1023}{1024}}+\sqrt{2^{\frac{511}{512}}+\sqrt{2^{\frac{255}{256}}+\sqrt{2^{\frac{127}{128}}+\sqrt{2^{\frac{63}{64}}+\sqrt{2^{\frac{31}{32}}+\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}}}}}}{2^{\frac{2047}{2048}}}$$

$$\sin\frac{\pi}{8192}=\frac{\sqrt{2^{\frac{2047}{2048}}-\sqrt{2^{\frac{1023}{1024}}+\sqrt{2^{\frac{511}{512}}+\sqrt{2^{\frac{255}{256}}+\sqrt{2^{\frac{127}{128}}+\sqrt{2^{\frac{63}{64}}+\sqrt{2^{\frac{31}{32}}+\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}}}}}}}{2^{\frac{4095}{4096}}}$$

$$\cos\frac{\pi}{8192}=\frac{\sqrt{2^{\frac{2047}{2048}}+\sqrt{2^{\frac{1023}{1024}}+\sqrt{2^{\frac{511}{512}}+\sqrt{2^{\frac{255}{256}}+\sqrt{2^{\frac{127}{128}}+\sqrt{2^{\frac{63}{64}}+\sqrt{2^{\frac{31}{32}}+\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}}}}}}}{2^{\frac{4095}{4096}}}$$

$$\sin\frac{\pi}{16384}=\frac{\sqrt{2^{\frac{4095}{4096}}-\sqrt{2^{\frac{2047}{2048}}+\sqrt{2^{\frac{1023}{1024}}+\sqrt{2^{\frac{511}{512}}+\sqrt{2^{\frac{255}{256}}+\sqrt{2^{\frac{127}{128}}+\sqrt{2^{\frac{63}{64}}+\sqrt{2^{\frac{31}{32}}+\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}}}}}}}}{2^{\frac{8191}{8192}}}$$

$$\cos\frac{\pi}{16384}=\frac{\sqrt{2^{\frac{4095}{4096}}+\sqrt{2^{\frac{2047}{2048}}+\sqrt{2^{\frac{1023}{1024}}+\sqrt{2^{\frac{511}{512}}+\sqrt{2^{\frac{255}{256}}+\sqrt{2^{\frac{127}{128}}+\sqrt{2^{\frac{63}{64}}+\sqrt{2^{\frac{31}{32}}+\sqrt{2^{\frac{15}{16}}+\sqrt{2^{\frac{7}{8}}+\sqrt{2^{\frac{3}{4}}+\sqrt{\sqrt{2}+1}}}}}}}}}}}}{2^{\frac{8191}{8192}}}$$

$$\sin\frac{\pi}{32768} = \frac{\sqrt{2^{\frac{8191}{8192}} - \sqrt{2^{\frac{4095}{4096}} + \sqrt{2^{\frac{2047}{2048}} + \sqrt{2^{\frac{1023}{1024}} + \sqrt{2^{\frac{511}{512}} + \sqrt{2^{\frac{255}{256}} + \sqrt{2^{\frac{127}{128}} + \sqrt{2^{\frac{63}{64}} + \sqrt{2^{\frac{31}{32}} + \sqrt{2^{\frac{15}{16}} + \sqrt{2^{\frac{7}{8}} + \sqrt{2^{\frac{3}{4}} + \sqrt{\sqrt{2}+1}}}}}}}}}}}}}}{2^{\frac{16383}{16384}}}$$

$$\cos\frac{\pi}{32768} = \frac{\sqrt{2^{\frac{8191}{8192}} + \sqrt{2^{\frac{4095}{4096}} + \sqrt{2^{\frac{2047}{2048}} + \sqrt{2^{\frac{1023}{1024}} + \sqrt{2^{\frac{511}{512}} + \sqrt{2^{\frac{255}{256}} + \sqrt{2^{\frac{127}{128}} + \sqrt{2^{\frac{63}{64}} + \sqrt{2^{\frac{31}{32}} + \sqrt{2^{\frac{15}{16}} + \sqrt{2^{\frac{7}{8}} + \sqrt{2^{\frac{3}{4}} + \sqrt{\sqrt{2}+1}}}}}}}}}}}}}}{2^{\frac{16383}{16384}}}$$

$$\sin\frac{\pi}{65536} = \frac{\sqrt{2^{\frac{16383}{16384}} - \sqrt{2^{\frac{8191}{8192}} + \sqrt{2^{\frac{4095}{4096}} + \sqrt{2^{\frac{2047}{2048}} + \sqrt{2^{\frac{1023}{1024}} + \sqrt{2^{\frac{511}{512}} + \sqrt{2^{\frac{255}{256}} + \sqrt{2^{\frac{127}{128}} + \sqrt{2^{\frac{63}{64}} + \sqrt{2^{\frac{31}{32}} + \sqrt{2^{\frac{15}{16}} + \sqrt{2^{\frac{7}{8}} + \sqrt{2^{\frac{3}{4}} + \sqrt{\sqrt{2}+1}}}}}}}}}}}}}}{2^{\frac{32767}{32768}}}$$

$$\cos\frac{\pi}{65536} = \frac{\sqrt{2^{\frac{16383}{16384}} + \sqrt{2^{\frac{8191}{8192}} + \sqrt{2^{\frac{4095}{4096}} + \sqrt{2^{\frac{2047}{2048}} + \sqrt{2^{\frac{1023}{1024}} + \sqrt{2^{\frac{511}{512}} + \sqrt{2^{\frac{255}{256}} + \sqrt{2^{\frac{127}{128}} + \sqrt{2^{\frac{63}{64}} + \sqrt{2^{\frac{31}{32}} + \sqrt{2^{\frac{15}{16}} + \sqrt{2^{\frac{7}{8}} + \sqrt{2^{\frac{3}{4}} + \sqrt{\sqrt{2}+1}}}}}}}}}}}}}}{2^{\frac{32767}{32768}}}$$

$$\sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$$

$$\cos\frac{\pi}{3} = \frac{1}{2}$$

$$\sin\frac{\pi}{6} = \frac{1}{2}$$

$$\cos\frac{\pi}{6} = \frac{\sqrt{3}}{2}$$

$$\sin\frac{\pi}{12} = \frac{\sqrt{2-\sqrt{3}}}{2}$$

$$\cos\frac{\pi}{12} = \frac{\sqrt{\sqrt{3}+2}}{2}$$

$$\sin\frac{\pi}{24} = \frac{\sqrt{2-\sqrt{\sqrt{3}+2}}}{2}$$

$$\cos\frac{\pi}{24} = \frac{\sqrt{\sqrt{\sqrt{3}+2}+2}}{2}$$

$$\sin\frac{\pi}{48} = \frac{\sqrt{2-\sqrt{\sqrt{\sqrt{3}+2}+2}}}{2}$$

$$\cos\frac{\pi}{48} = \frac{\sqrt{\sqrt{\sqrt{\sqrt{3}+2}+2}+2}}{2}$$

$$\sin\frac{\pi}{96} = \frac{\sqrt{2-\sqrt{\sqrt{\sqrt{\sqrt{3}+2}+2}+2}}}{2}$$

$$\cos\frac{\pi}{96} = \frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{3}+2}+2}+2}+2}}{2}$$

$$\sin\tfrac{\pi}{192} = \frac{\sqrt{2-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{3}+2}+2}+2}+2}+2}}{2}$$

$$\cos\tfrac{\pi}{192} = \frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{3}+2}+2}+2}+2}+2}+2}{2}$$

$$\sin\tfrac{\pi}{384} = \frac{\sqrt{2-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{3}+2}+2}+2}+2}+2}+2}}{2}$$

$$\cos\tfrac{\pi}{384} = \frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{3}+2}+2}+2}+2}+2}+2}{2}$$

$$\sin\tfrac{\pi}{768} = \frac{\sqrt{2-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{3}+2}+2}+2}+2}+2}+2}}{2}$$

$$\cos\tfrac{\pi}{768} = \frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{3}+2}+2}+2}+2}+2}+2}+2}{2}$$

$$\sin\tfrac{\pi}{1536} = \frac{\sqrt{2-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{3}+2}+2}+2}+2}+2}+2}+2}}{2}$$

$$\cos\tfrac{\pi}{1536} = \frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{3}+2}+2}+2}+2}+2}+2}+2}+2}{2}$$

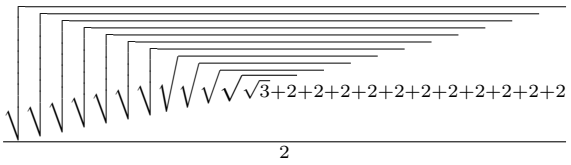
$$\sin\tfrac{\pi}{3072} = \frac{\sqrt{2-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{3}+2}+2}+2}+2}+2}+2}+2}+2}}{2}$$

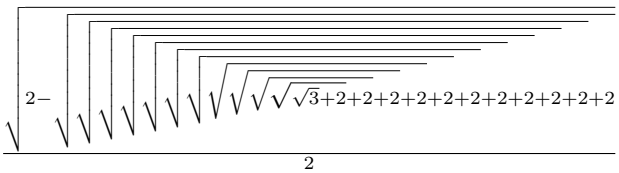
$$\cos\tfrac{\pi}{3072} = \frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{3}+2}+2}+2}+2}+2}+2}+2}+2}+2}{2}$$

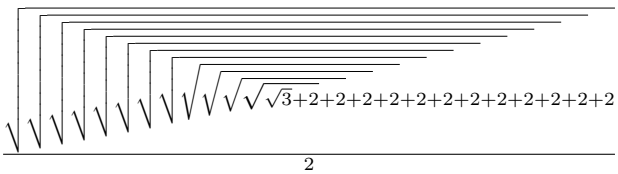
$$\sin\tfrac{\pi}{6144} = \frac{\sqrt{2-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{3}+2}+2}+2}+2}+2}+2}+2}+2}+2}}{2}$$

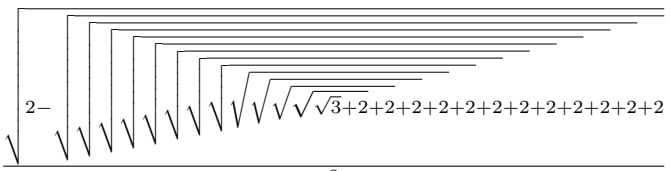
$$\cos\tfrac{\pi}{6144} = \frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{3}+2}+2}+2}+2}+2}+2}+2}+2}+2}{2}$$

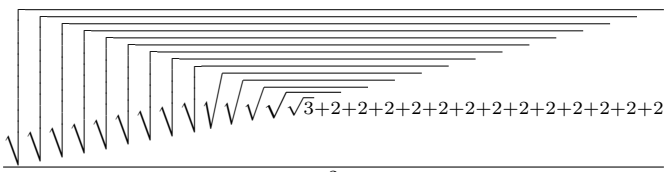
$$\sin\tfrac{\pi}{12288} = \frac{\sqrt{2-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{3}+2}+2}+2}+2}+2}+2}+2}+2}+2}}{2}$$

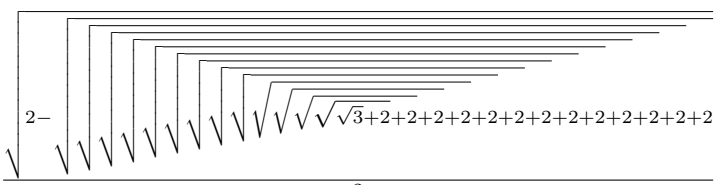
$$\cos\tfrac{\pi}{12288} = \frac{\sqrt{\phantom{x}}}{2}$$


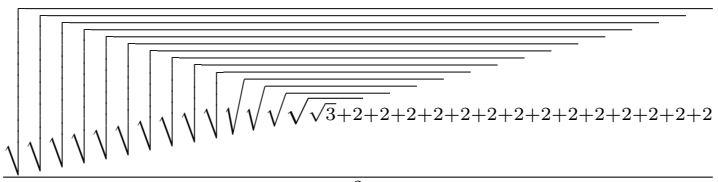
$$\sin\tfrac{\pi}{24576} = \frac{\sqrt{2-}}{2}$$


$$\cos\tfrac{\pi}{24576} = \frac{\sqrt{\phantom{x}}}{2}$$


$$\sin\tfrac{\pi}{49152} = \frac{\sqrt{2-}}{2}$$


$$\cos\tfrac{\pi}{49152} = \frac{\sqrt{\phantom{x}}}{2}$$


$$\sin\tfrac{\pi}{98304} = \frac{\sqrt{2-}}{2}$$


$$\cos\tfrac{\pi}{98304} = \frac{\sqrt{\phantom{x}}}{2}$$


$$\cos\tfrac{\pi}{5} = \frac{\sqrt{5}+1}{4}$$

$$\sin\tfrac{\pi}{10} = \frac{\sqrt{3-\sqrt{5}}}{2^{\frac{3}{2}}}$$

$$\cos\tfrac{\pi}{10} = \frac{\sqrt{\sqrt{5}+5}}{2^{\frac{3}{2}}}$$

$$\sin\tfrac{\pi}{20} = \frac{\sqrt{2^{\frac{3}{2}}-\sqrt{\sqrt{5}+5}}}{2^{\frac{5}{4}}}$$

$$\cos\tfrac{\pi}{20} = \frac{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}}{2^{\frac{5}{4}}}$$

$$\sin\frac{\pi}{40}=\frac{\sqrt{2^{\frac{5}{4}}-\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}}}{2^{\frac{9}{8}}}$$

$$\cos\frac{\pi}{40}=\frac{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}}{2^{\frac{9}{8}}}$$

$$\sin\frac{\pi}{80}=\frac{\sqrt{2^{\frac{9}{8}}-\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}}}{2^{\frac{17}{16}}}$$

$$\cos\frac{\pi}{80}=\frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}}{2^{\frac{17}{16}}}$$

$$\sin\frac{\pi}{160}=\frac{\sqrt{2^{\frac{17}{16}}-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}}}{2^{\frac{33}{32}}}$$

$$\cos\frac{\pi}{160}=\frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}}{2^{\frac{33}{32}}}$$

$$\sin\frac{\pi}{320}=\frac{\sqrt{2^{\frac{33}{32}}-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}}}{2^{\frac{65}{64}}}$$

$$\cos\frac{\pi}{320}=\frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}+2^{\frac{33}{32}}}}{2^{\frac{65}{64}}}$$

$$\sin\frac{\pi}{640}=\frac{\sqrt{2^{\frac{65}{64}}-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}+2^{\frac{33}{32}}}}}{2^{\frac{129}{128}}}$$

$$\cos\frac{\pi}{640}=\frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}+2^{\frac{33}{32}}}+2^{\frac{65}{64}}}}{2^{\frac{129}{128}}}$$

$$\sin\frac{\pi}{1280}=\frac{\sqrt{2^{\frac{129}{128}}-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}+2^{\frac{33}{32}}}+2^{\frac{65}{64}}}}}{2^{\frac{257}{256}}}$$

$$\cos\frac{\pi}{1280}=\frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}+2^{\frac{33}{32}}}+2^{\frac{65}{64}}}+2^{\frac{129}{128}}}}{2^{\frac{257}{256}}}$$

$$\sin\frac{\pi}{2560}=\frac{\sqrt{2^{\frac{257}{256}}-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}+2^{\frac{33}{32}}}+2^{\frac{65}{64}}}+2^{\frac{129}{128}}}}}{2^{\frac{513}{512}}}$$

$$\cos\frac{\pi}{2560}=\frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}+2^{\frac{33}{32}}}+2^{\frac{65}{64}}}+2^{\frac{129}{128}}}+2^{\frac{257}{256}}}}{2^{\frac{513}{512}}}$$

$$\sin\frac{\pi}{5120}=\frac{\sqrt{2^{\frac{513}{512}}-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}+2^{\frac{33}{32}}}+2^{\frac{65}{64}}}+2^{\frac{129}{128}}}+2^{\frac{257}{256}}}}}{2^{\frac{1025}{1024}}}$$

$$\cos\frac{\pi}{5120}=\frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}+2^{\frac{33}{32}}}+2^{\frac{65}{64}}}+2^{\frac{129}{128}}}+2^{\frac{257}{256}}}+2^{\frac{513}{512}}}}{2^{\frac{1025}{1024}}}$$

$$\sin\frac{\pi}{10240}=\frac{\sqrt{2^{\frac{1025}{1024}}-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}+2^{\frac{33}{32}}}+2^{\frac{65}{64}}}+2^{\frac{129}{128}}}+2^{\frac{257}{256}}}+2^{\frac{513}{512}}}}}{2^{\frac{2049}{2048}}}$$

$$\cos\frac{\pi}{10240}=\frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}+2^{\frac{33}{32}}}+2^{\frac{65}{64}}}+2^{\frac{129}{128}}}+2^{\frac{257}{256}}}+2^{\frac{513}{512}}}+2^{\frac{1025}{1024}}}}{2^{\frac{2049}{2048}}}$$

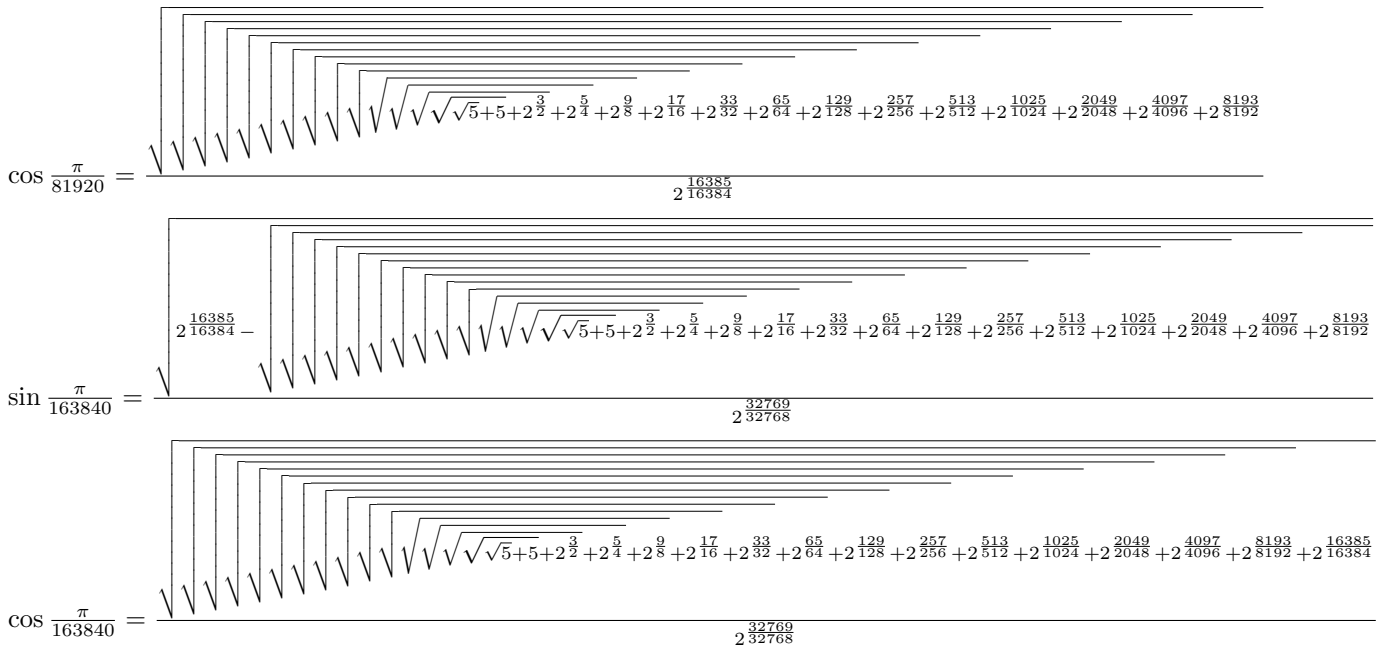
$$\sin\frac{\pi}{20480}=\frac{\sqrt{2^{\frac{2049}{2048}}-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}+2^{\frac{33}{32}}}+2^{\frac{65}{64}}}+2^{\frac{129}{128}}}+2^{\frac{257}{256}}}+2^{\frac{513}{512}}}+2^{\frac{1025}{1024}}}}}{2^{\frac{4097}{4096}}}$$

$$\cos\frac{\pi}{20480}=\frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}+2^{\frac{33}{32}}}+2^{\frac{65}{64}}}+2^{\frac{129}{128}}}+2^{\frac{257}{256}}}+2^{\frac{513}{512}}}+2^{\frac{1025}{1024}}}+2^{\frac{2049}{2048}}}}{2^{\frac{4097}{4096}}}$$

$$\sin\frac{\pi}{40960}=\frac{\sqrt{2^{\frac{4097}{4096}}-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}+2^{\frac{33}{32}}}+2^{\frac{65}{64}}}+2^{\frac{129}{128}}}+2^{\frac{257}{256}}}+2^{\frac{513}{512}}}+2^{\frac{1025}{1024}}}+2^{\frac{2049}{2048}}}}}{2^{\frac{8193}{8192}}}$$

$$\cos\frac{\pi}{40960}=\frac{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}+2^{\frac{33}{32}}}+2^{\frac{65}{64}}}+2^{\frac{129}{128}}}+2^{\frac{257}{256}}}+2^{\frac{513}{512}}}+2^{\frac{1025}{1024}}}+2^{\frac{2049}{2048}}}+2^{\frac{4097}{4096}}}}{2^{\frac{8193}{8192}}}$$

$$\sin\frac{\pi}{81920}=\frac{\sqrt{2^{\frac{8193}{8192}}-\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{5}+5}+2^{\frac{3}{2}}}+2^{\frac{5}{4}}}+2^{\frac{9}{8}}}+2^{\frac{17}{16}}}+2^{\frac{33}{32}}}+2^{\frac{65}{64}}}+2^{\frac{129}{128}}}+2^{\frac{257}{256}}}+2^{\frac{513}{512}}}+2^{\frac{1025}{1024}}}+2^{\frac{2049}{2048}}}+2^{\frac{4097}{4096}}}}}{2^{\frac{16385}{16384}}}$$



Documento compilado em Thursday 13th January, 2022, 16:54, tempo no servidor.

Última versão do documento (podem haver correções e/ou aprimoramentos):
"bit.ly/mathematicalramblings_public".

Sugestões, comunicar erros: "a.vandre.g@gmail.com".