Transcomputation - Answers 2

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1 Simplify the following transarithmetical expressions to show that each relation evaluates true

1.2.1)

$$\begin{aligned} \infty(3-3) &= 3\infty - 3\infty \\ 0\infty &= \infty - \infty \\ \Phi &= \Phi \end{aligned}$$

1.2.2)

$$\begin{aligned} \infty(2+\Phi) &= 2\infty + \infty\Phi \\ \infty\Phi &= \infty + \Phi \\ \Phi &= \Phi \end{aligned}$$

1.2.3)

$$\begin{aligned} \Phi(3-2) &= 3\Phi - 2\Phi \\ 1\Phi &= \Phi - \Phi \\ \Phi &= \Phi \end{aligned}$$

1.2.4)

$$\begin{aligned} 2(\infty+3) &= 2\infty + 2 \times 3 \\ 2\infty &= \infty + 6 \\ \infty &= \infty \end{aligned}$$

2 Expand the following transarithmetical expressions and say whether each relation evaluates true or else false

2.3.1)

$$\begin{aligned} 1^{\infty} &= 1^2 \\ e^{\ln 1^{\infty}} &= 1 \\ e^{\infty \ln 1} &= 1 \\ e^{0\infty} &= 1 \\ e^{\Phi} &= 1 \\ \Phi &= 1 \end{aligned}$$

Therefore false.

2.3.2)

$$\begin{aligned} 1^1 &> 0^0 \\ 1 &> e^{\ln 0^0} \\ 1 &> e^{0 \ln 0} \\ 1 &> e^{0(-\infty)} \\ 1 &> e^{\Phi} \\ 1 &> \Phi \end{aligned}$$

Therefore false.

2.3.3)

$$\begin{aligned} \Phi^{\Phi} &\not> 1^{\Phi} \\ e^{\ln \Phi^{\Phi}} &\not> e^{\ln 1^{\Phi}} \\ e^{\Phi \ln \Phi} &\not> e^{\Phi \ln 1} \\ e^{\Phi} &\not> e^{\Phi} \end{aligned}$$

Therefore true.

2.3.4)

$$\begin{aligned} \infty^{\infty} &= \infty \\ e^{\ln \infty^{\infty}} &= \infty \\ e^{\infty \ln \infty} &= \infty \\ e^{\infty \infty} &= \infty \\ e^{\infty} &= \infty \\ \infty &= \infty \end{aligned}$$

Therefore true.

3 Evaluate the following power series at $x = -\infty, \Phi, \infty$

3.2.1)

$$\begin{aligned}
\sin(-\infty) &= \tfrac{-\infty^1}{1!} - \tfrac{-\infty^3}{3!} + ... \\
&= \tfrac{-\infty}{1!} - \tfrac{-\infty}{3!} + ... \\
&= -\infty - (-\infty) + ... \\
&= -\infty + \infty + ... \\
&= \Phi + ... \\
&= \Phi
\end{aligned}$$

$$\begin{aligned}
\sin(\infty) &= \tfrac{\infty^1}{1!} - \tfrac{\infty^3}{3!} + ... \\
&= \tfrac{\infty}{1!} - \tfrac{\infty}{3!} + ... \\
&= \infty - \infty + ... \\
&= \Phi + ... \\
&= \Phi
\end{aligned}$$

$$\begin{aligned}
\sin(\Phi) &= \tfrac{\Phi^1}{1!} - ... \\
&= \tfrac{\Phi}{1!} - ... \\
&= \Phi - ... \\
&= \Phi
\end{aligned}$$

3.2.2)

$$\begin{aligned}
\cos(-\infty) &= 1 - \tfrac{-\infty^2}{2!} + \tfrac{-\infty^4}{4!} + ... \\
&= 1 - \tfrac{\infty}{2!} + \tfrac{\infty}{4!} + ... \\
&= 1 - \infty + \infty + ... \\
&= 1 + \Phi + ... \\
&= \Phi + ... \\
&= \Phi
\end{aligned}$$

$$\begin{aligned}
\cos(\infty) &= 1 - \tfrac{\infty^2}{2!} + \tfrac{\infty^4}{4!} + ... \\
&= 1 - \tfrac{\infty}{2!} + \tfrac{\infty}{4!} + ... \\
&= 1 - \infty + \infty + ... \\
&= 1 + \Phi + ... \\
&= \Phi + ... \\
&= \Phi
\end{aligned}$$

$$\begin{aligned}
\cos(\Phi) &= 1 - \tfrac{\Phi^2}{2!} + ... \\
&= 1 - \tfrac{\Phi}{2!} + ... \\
&= 1 - \Phi + ... \\
&= -\Phi + ... \\
&= \Phi + ... \\
&= \Phi
\end{aligned}$$

4 Sketch the following graphs.

We will look at these in class. I would be happy to include your sketches here if you prepare good sketches for your portfolio.
4.2.1) e^x
4.2.2) $\ln x$
4.2.3) $\sin x$
4.2.4) $\cos x$
4.2.5) $\tan x$
4.2.6) $\cos^2 x + \sin^2 x = 1^x$