$$\frac{d}{dx}(\sin x) = \cos x$$

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Start End

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Theorem

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Theorem

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Proof.

Start End

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Theorem

$$\frac{d}{dx}(\sin x) = \cos x$$

Proof.

$$\frac{d}{dx}(\sin x) = \lim_{h \to 0} \frac{\sin(x+h) - \sin x}{h}$$

Start End

Theorem

$$\frac{d}{dx}(\sin x) = \cos x$$

Proof.

$$\frac{d}{dx}(\sin x) = \lim_{h \to 0} \frac{\sin(x+h) - \sin x}{h} = \lim_{h \to 0} \frac{\sin x \cos h + \cos x \sin h - \sin x}{h}$$

Start End

Theorem

$$\frac{d}{dx}(\sin x) = \cos x$$

Proof.

$$\begin{aligned}
\frac{d}{dx}(\sin x) &= \lim_{h\to 0} \frac{\sin(x+h) - \sin x}{h} = \lim_{h\to 0} \frac{\sin x \cos h + \cos x \sin h - \sin x}{h} \\
&= \lim_{h\to 0} \left\{ \sin x \cdot \frac{\cos h - 1}{h} + \cos x \cdot \frac{\sin h}{h} \right\}
\end{aligned}$$

Start End

Theorem

$$\frac{d}{dx}(\sin x) = \cos x$$

Proof.

$$\begin{aligned}
\frac{d}{dx}(\sin x) &= \lim_{h\to 0}\frac{\sin(x+h)-\sin x}{h} = \lim_{h\to 0}\frac{\sin x\cos h+\cos x\sin h-\sin x}{h} \\
&= \lim_{h\to 0}\left\{\sin x\cdot\frac{\cos h-1}{h}+\cos x\cdot\frac{\sin h}{h}\right\} \\
&= \lim_{h\to 0}\left\{\sin x\cdot\frac{\cos h-1}{h}\times\frac{\cos h+1}{\cos h+1}+\cos x\cdot\frac{\sin h}{h}\right\}
\end{aligned}$$

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&= \lim_{h\to 0}\left\{\sin x\cdot\frac{\cos h-1}{h}\times\frac{\cos h+1}{\cos h+1}+\cos x\cdot\frac{\sin h}{h}\right\} \\
&= \lim_{h\to 0}\left\{\sin x\cdot\frac{\cos^2 h-1}{h(\cos h+1)}+\cos x\cdot\frac{\sin h}{h}\right\}
\end{aligned}$$

▸ Start ▸ End

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\frac{d}{dx}(\sin x) &= \lim_{h\to 0} \frac{\sin(x+h) - \sin x}{h} = \lim_{h\to 0} \frac{\sin x \cos h + \cos x \sin h - \sin x}{h} \\
&= \lim_{h\to 0} \left\{ \sin x \cdot \frac{\cos h - 1}{h} + \cos x \cdot \frac{\sin h}{h} \right\} \\
&= \lim_{h\to 0} \left\{ \sin x \cdot \frac{\cos h - 1}{h} \times \frac{\cos h + 1}{\cos h + 1} + \cos x \cdot \frac{\sin h}{h} \right\} \\
&= \lim_{h\to 0} \left\{ \sin x \cdot \frac{\cos^2 h - 1}{h(\cos h + 1)} + \cos x \cdot \frac{\sin h}{h} \right\} \\
&= \lim_{h\to 0} \left\{ \sin x \cdot \frac{-\sin^2 h}{h(\cos h + 1)} + \cos x \cdot \frac{\sin h}{h} \right\}
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&= \lim_{h\to 0}\left\{\sin x\cdot\left(-\frac{\sin h}{h}\right)\cdot\frac{\sin h}{\cos h+1}+\cos x\cdot\frac{\sin h}{h}\right\}
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&= \cos x
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&= \cos x
\end{aligned}$$

□

Github:
https://min7014.github.io/math20240218001.html

Click or paste URL into the URL search bar, and you can see a picture moving.