Lecture 32: Addition formulae

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Question 1.

Which of the following is true?

A $\sin(\pi/4) + \sin(\pi/4) = \sin(\pi/2)$.

B $\cos(\pi/6) - \cos(\pi/6) = \cos(0)$

C $\sin(\pi/3) + \sin(\pi) = \sin(4\pi/3)$

D $\sin(\pi/3) + \sin(5\pi/3) = \sin(2\pi)$

E $\sin(42x) = 42\sin(x)$

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D.

We have $\sin(\pi/3) = \sqrt{3}/2$ and $\sin(5\pi/3) = -\sqrt{3}/2$, thus $\sin(\pi/3) + \sin(5\pi/3) = 0 = \sin(2\pi)$.

None of the other statements are true. The point of this problem is that the rules $\sin(ax) = a\sin(x)$, $\sin(x + y) = \sin(x) + \sin(y)$ are not identically true.

But the broken clock is right once a day.

Question 2.

The angle t is in standard position and the terminal side passes through the point $(3, -4)$. Find $\sin(2t)$. Hint: $2t = t + t$.

A $-24/25$

B $24/25$

C $-1/5$

D $7/25$

E $-7/25$

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We have $\cos(t) = 3/5$ and $\sin(t) = -4/5$. Using the addition formula for cosine, we have

$$\begin{aligned} \sin(2t) &= \sin(t+t) \\ &= \sin(t)\cos(t) + \cos(t)\sin(t) \\ &= -12/25 - 12/25 = -24/25 \end{aligned}$$