

Turn in your Graded HW with
work stapled to the back

GHW QUIZ

Keep GHW12 Due Date as 2/5
Ignore 1/31 due date on assignmt sheet

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Worksheet 7.1

1. $\frac{63}{65}$

2. $-\frac{56}{65}$

3. $-\frac{16}{63}$

4. $\frac{7}{25}$

5. $-161/289$

6. $-\frac{336}{625}$

Keep GHW12 Due Date as 2/5
Ignore 1/31 due date on assignmt sheet

⑦ $\tan \theta = \frac{\sqrt{3}}{3}, I, \theta = \frac{\pi}{6}$
 $\sin \frac{\pi}{6} = \frac{1}{2}$

7. $\frac{1}{2}$

$\cos 2\theta = 1 - 2\sin^2 \theta$

$= 1 - 2\left(\frac{1}{2}\right)^2$

$= 1 - 2\left(\frac{1}{4}\right)$

$= 1 - \frac{1}{2} = \frac{1}{2}$

8. $\frac{24}{25}$

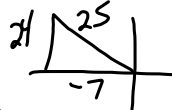
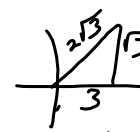
9. $\sin(-2\theta)$

⑥ $\cos \theta = -\frac{7}{25}, II,$

10. $\cos(7x)$

$\sin 2\theta = 2\sin \theta \cos \theta$

$= 2\left(\frac{24}{25}\right)\left(-\frac{7}{25}\right) = -\frac{336}{625}$



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Half Angles

Pre-Calc
Unit 7 Day3

Functions of the Half Angle

$$\sin \frac{1}{2}A = \pm \sqrt{\frac{1 - \cos A}{2}} \quad \cos \frac{1}{2}A = \pm \sqrt{\frac{1 + \cos A}{2}}$$

Determining positive or negative values of $\frac{1}{2}$ angles

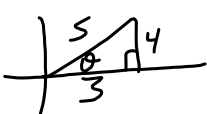
Domain of Angle	Domain of $\frac{1}{2}$ Angle	Quadrant of $\frac{1}{2}$ Angle	Sign of Function of $\frac{1}{2}$ Angle
$0 < A < \frac{\pi}{2}$	$0 < \frac{1}{2}A < \frac{\pi}{4}$	I	$\sin \frac{1}{2}A > 0$ $\cos \frac{1}{2}A > 0$
$\frac{\pi}{2} < A < \pi$	$\frac{\pi}{4} < \frac{1}{2}A < \frac{\pi}{2}$	I	$\sin \frac{1}{2}A > 0$ $\cos \frac{1}{2}A > 0$
$\pi < A < \frac{3\pi}{2}$	$\frac{\pi}{2} < \frac{1}{2}A < \frac{3\pi}{4}$	II	$\sin \frac{1}{2}A > 0$ $\cos \frac{1}{2}A < 0$
$\frac{3\pi}{2} < A < 2\pi$	$\frac{3\pi}{4} < \frac{1}{2}A < \pi$	II	$\sin \frac{1}{2}A > 0$ $\cos \frac{1}{2}A < 0$

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Examples:

1. If $\sin \theta = \frac{4}{5}$ and θ is a positive acute angle, find $\sin \frac{\theta}{2}$.

$0 < \theta < \frac{\pi}{2} \rightarrow \frac{\pi}{2} \cdot \frac{1}{2}$
 $0 < \frac{1}{2}\theta < \frac{\pi}{4} \rightarrow \text{I}$

$$\sin \frac{\theta}{2} = \sqrt{\frac{1 - \cos \theta}{2}} = \sqrt{\frac{1 - \frac{3}{5}}{2}} = \sqrt{\frac{\frac{2}{5}}{2}} = \sqrt{\frac{2}{5} \cdot \frac{1}{2}} = \sqrt{\frac{2}{10}} = \sqrt{\frac{1}{5}} = \frac{1}{\sqrt{5}} = \frac{\sqrt{5}}{5}$$


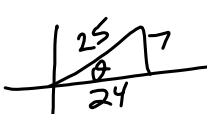
2. If $\cos \theta = \frac{1}{2}$ and $\frac{3\pi}{2} < \theta < 2\pi$, find $\cos \frac{\theta}{2}$.

$\frac{3\pi}{4} < \frac{1}{2}\theta < \pi \rightarrow \text{II}$

$$\cos \frac{\theta}{2} = -\sqrt{\frac{1 + \cos \theta}{2}} = -\sqrt{\frac{1 + \frac{1}{2}}{2}} = -\sqrt{\frac{\frac{3}{2}}{2}} = -\sqrt{\frac{3}{4}} = -\frac{\sqrt{3}}{2}$$

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3. Find $\sin \frac{1}{2}\theta$, if $\tan \theta = \frac{7}{24}$ and $0 < \theta < \frac{\pi}{2} \rightarrow I$ $0 < \frac{1}{2}\theta < \frac{\pi}{4} \rightarrow I$

$$\sin \frac{1}{2}\theta = \oplus \sqrt{\frac{1 - \cos \theta}{2}} = \sqrt{\frac{1 - \frac{24}{25}}{2}} = \sqrt{\frac{\frac{1}{25}}{2}} = \sqrt{\frac{1}{25} \cdot \frac{1}{2}} = \sqrt{\frac{1}{50}} = \frac{1}{\sqrt{50}} = \frac{1}{\sqrt{25} \sqrt{2}} = \frac{1}{5\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{5 \cdot 2} = \frac{\sqrt{2}}{10}$$


4. If $\cos x = \frac{1}{9}$, find the positive value of $\sin \frac{1}{2}x$

$$\sin \frac{1}{2}x = \oplus \sqrt{\frac{1 - \cos x}{2}} = \sqrt{\frac{1 - \frac{1}{9}}{2}} = \sqrt{\frac{\frac{8}{9}}{2}} = \sqrt{\frac{8}{9} \cdot \frac{1}{2}} = \sqrt{\frac{8}{18}} = \sqrt{\frac{4}{9}} = \frac{2}{3}$$

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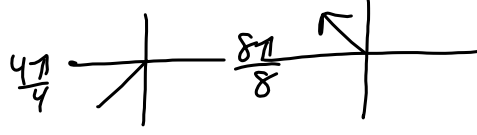
Use the half-angle identities to evaluate exactly. $2\left(\frac{\pi}{12}\right) = \left(\frac{1}{2}\theta\right) \rightarrow \frac{\pi}{6} = \frac{1}{2}\theta$

5. $\sin\left(\frac{\pi}{12}\right) = \sin\left(\frac{1}{2} \cdot \frac{\pi}{6}\right) = \oplus \sqrt{\frac{1 - \cos \frac{\pi}{6}}{2}} \quad \theta = \frac{\pi}{6} = \frac{\pi}{6}$

$$= \sqrt{\frac{1 - \frac{\sqrt{3}}{2}}{2}} = \sqrt{\frac{\frac{2 - \sqrt{3}}{2}}{2}} = \sqrt{\frac{2 - \sqrt{3}}{4}} = \frac{\sqrt{2 - \sqrt{3}}}{2}$$

6. $\cos\left(\frac{5\pi}{8}\right) = \cos\left(\frac{1}{2} \cdot \frac{5\pi}{4}\right) = \ominus \sqrt{\frac{1 + \cos \frac{5\pi}{4}}{2}} \rightarrow III \quad \frac{1}{2} = \frac{4\pi}{8}$

$2\left(\frac{5\pi}{8}\right) = \left(\frac{1}{2}\theta\right) \rightarrow \frac{5\pi}{4} = \theta$



$$= -\sqrt{\frac{1 + \left(-\frac{\sqrt{2}}{2}\right)}{2}} = -\frac{\sqrt{2 - \sqrt{2}}}{2}$$

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Find the exact value of each.

7. $\tan \theta = -\frac{\sqrt{3}}{3}$ where $\frac{\pi}{2} \leq \theta < \pi$ $\rightarrow \frac{\pi}{4} < \frac{\theta}{2} < \frac{\pi}{2}$

$\sin 2\theta = 2 \sin \theta \cos \theta$

$= 2\left(\frac{1}{2}\right)\left(-\frac{\sqrt{3}}{2}\right)$

$= -\frac{2\sqrt{3}}{4}$

$= -\frac{\sqrt{3}}{2}$

$\cos \frac{\theta}{2} = \frac{\sqrt{2-\sqrt{3}}}{2}$

$\cos 2\theta = \frac{1}{2}$

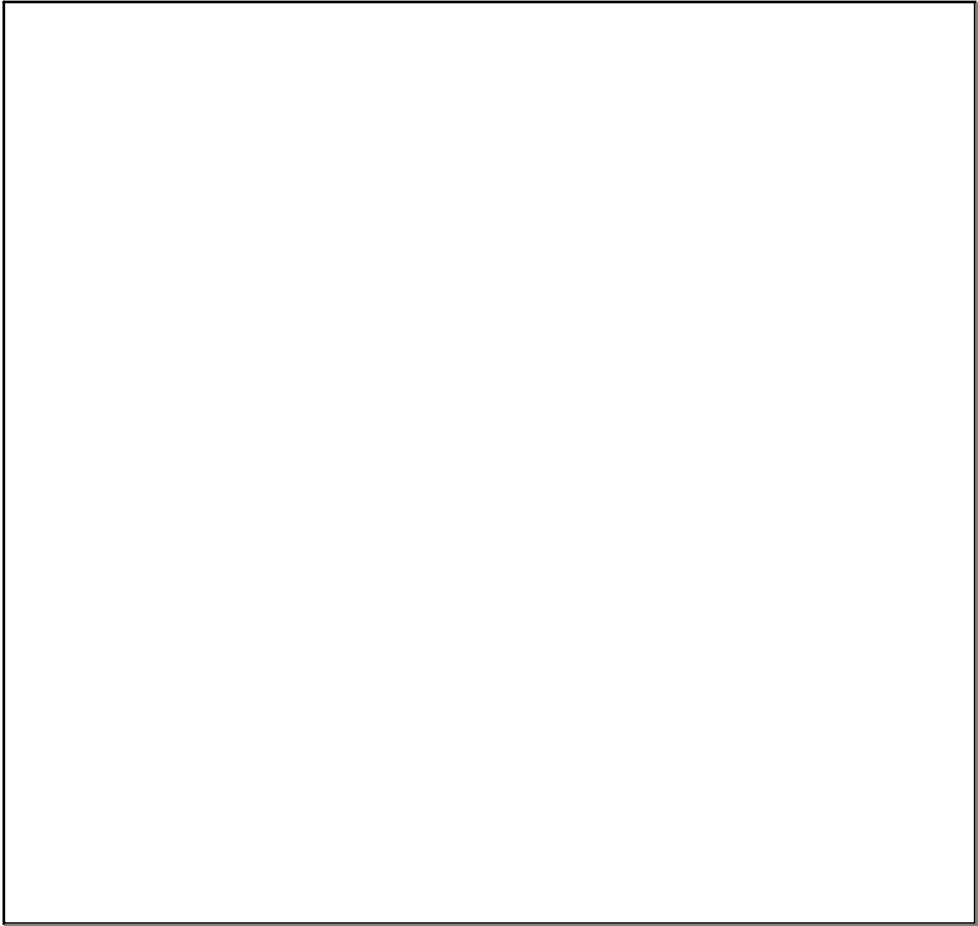
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HW 7-3

WORKSHEET 7.1

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