A44 Sect. 2.5 p. 257 - 259 / 1-13 odd, 19, 21, 25, 27, 31, 37-41 odd
~~45~~, 53, 65, 69, 73, 77, ~~84~~, 95, 99, 101

1. $\sin\theta = \boxed{\frac{3}{5}}$

3. $\cos 2\theta = 1 - 2\left(\frac{3}{5}\right)^2$

My way: $= \frac{25}{25} - \frac{18}{25}$

another way?? / $= \boxed{\frac{7}{25}}$

5. $\tan 2\theta = \frac{2 \cdot \frac{3}{4}}{1 - \left(\frac{3}{4}\right)^2}$

$= \frac{\frac{3}{2}}{\frac{16}{16} - \frac{9}{16}}$

$= \frac{3}{2} \cdot \frac{16}{7}$

(5) $\boxed{\frac{24}{7}}$

7. $\csc 2\theta = \frac{1}{\sin 2\theta}$

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

$= \frac{1}{2 \cdot \frac{3}{5} \cdot \frac{4}{5}}$

(7) $\boxed{\frac{25}{24}}$

9. $\sin 2x - \sin x = 0$

$2\sin x\cos x - \sin x = 0$

$\sin x$

2PP $\sin x\,(2\cos x - 1) = 0$

$\sin x = 0$ $\qquad 2\cos x = 1$

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

(9) $\boxed{x = 0, \pi \qquad x = \frac{\pi}{3}, \frac{5\pi}{3}}$

11. $4\sin x\cos x = 1$

$2(2\sin x\cos x) = 1$

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

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

$\sin^{-1}$ $\qquad = \sin^{-1}$

$2x = \sin^{-1}\frac{1}{2}$

$\frac{2x}{2} = \frac{\frac{\pi}{6}}{2} + \frac{2\pi n}{2} \qquad \frac{2x}{2} = \frac{\frac{5\pi}{6}}{2} + \frac{2\pi n}{2}$

$x = \frac{\pi}{12} + \pi n \qquad x = \frac{5\pi}{12} + \pi n$

(11) $\boxed{x = \frac{\pi}{12}, \frac{13\pi}{12}, \frac{5\pi}{12}, \frac{17\pi}{12}}$

*13. $\cos 2x - \cos x = 0$

$2\cos^2 x - 1 - \cos x = 0$

$2\cos^2 x - \cos x - 1 = 0$

$-2 \cdot 1 = -2$, $-2 + 1 = -1$

$2\cos^2 x - 2\cos x + \cos x - 1 = 0$

$2\cos x$ $\qquad 1$

$2\cos x(\cos x - 1) + 1(\cos x - 1) = 0$

$(\cos x - 1)$

2PP $(\cos x - 1)(2\cos x + 1) = 0$

$\cos x = 1$ $\qquad 2\cos x = -1$

$\cos^{-1}$ $\quad \cos^{-1}$ $\qquad \cos x = -\frac{1}{2}$

(13) $\boxed{x = 0 \qquad x = \frac{2\pi}{3}, \frac{4\pi}{3}}$

19. $6\sin x\cos x$

$3(2\sin x\cos x)$

(19) $\boxed{3\sin 2x}$

21. $\frac{4 - 8\sin^2 x}{4}$

$4(1 - 2\sin^2 x)$

(21) $\boxed{4\cos 2x}$

25. $\tan u = \frac{1}{2}$ Q3

$\sin 2u = 2\sin u\cos u$

$= 2 \cdot \frac{-1}{\sqrt{5}} \cdot \frac{-2}{\sqrt{5}}$

$= \boxed{\frac{4}{5}}$

$\cos 2u = 1 - 2\left(\frac{-1}{\sqrt{5}}\right)^2$

$= \frac{5}{5} - \frac{2}{5}$

$= \boxed{\frac{3}{5}}$

$\tan 2u = \frac{2\tan x}{1 - \tan^2 x}$

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

$= \frac{1}{\frac{4}{4} - \frac{1}{4}}$

$= \boxed{\frac{4}{3}}$

27. $\sec u = -\frac{5}{2}$

$\cos u = -\frac{2}{5}$

$\sin 2u = 2 \sin u \cos u$

$= 2\left(\frac{\sqrt{21}}{5}\right)\left(-\frac{2}{5}\right)$

$= \boxed{\frac{-4\sqrt{21}}{25}}$

$\cos 2u = \cos^2 u - \sin^2 u$

$= \left(-\frac{2}{5}\right)^2 - \left(\frac{\sqrt{21}}{5}\right)^2$

$= \frac{4}{25} - \frac{21}{25}$

$= \boxed{\frac{-17}{25}}$

$\tan 2u = \frac{2\tan u}{1 - \tan^2 u}$

$= \frac{2\left(\frac{\sqrt{21}}{-2}\right)}{1 - \left(\frac{\sqrt{21}}{-2}\right)^2}$

$= \frac{-\sqrt{21}}{\frac{4}{4} - \frac{21}{4}}$

$= -\sqrt{21} \cdot \frac{4}{-17}$

$= \boxed{\frac{4\sqrt{21}}{17}}$

31. $\sin^2 x \cos^2 x$ ← Power reducing identity $\sin^2 x$ or $\cos^2 x$ ↑

$\left(\frac{1 - \cos 2x}{2}\right)\left(\frac{1 + \cos 2x}{2}\right)$

$\frac{1}{2}(1 - \cos 2x)\frac{1}{2}(1 + \cos 2x)$

$\frac{1}{4}(1 - \cos^2 2x)$

$\frac{1}{4}\left[1 - \left(\frac{1 + \cos 4x}{2}\right)\right]$

$\frac{1}{4} - \frac{1}{8}(1 + \cos 4x)$

$\frac{1}{4} - \frac{1}{8} - \frac{1}{8}\cos 4x$

$\frac{1}{8} - \frac{1}{8}\cos 4x$

$\boxed{\frac{1}{8}(1 - \cos 4x)}$

37. $\tan\frac{\theta}{2} = \frac{\sin a}{1 + \cos a}$

$= \frac{\frac{5}{13}}{1 + \frac{12}{13}}$

$= \frac{5}{13} \cdot \frac{13}{25}$

(37) $\boxed{\frac{1}{5}}$

39. $\csc\frac{\theta}{2} = \frac{1}{\sin\frac{\theta}{2}}$

$\sin\frac{\theta}{2} = \sqrt{\frac{1 - \cos\theta}{2}}$

$= \sqrt{\frac{1 - \frac{12}{13}}{2}}$

$= \sqrt{\frac{1}{13} \cdot \frac{1}{2}}$

$\frac{1}{\sqrt{\frac{1}{26}} \cdot \sqrt{\frac{1}{26}}}$ $\frac{\frac{1}{26}}{}$

$26\sqrt{\frac{1}{26}}$

$26\frac{1}{\sqrt{26}} \cdot \frac{\sqrt{26}}{\sqrt{26}}$

$\boxed{\sqrt{26}}$

41. 105° $\left(\frac{210^\circ}{2}\right)$

$\sin\left(\frac{210}{2}\right) = \pm\sqrt{\frac{1 - \cos 210^\circ}{2}}$

↳ Q2 so → $= +\sqrt{\frac{1 - -\frac{\sqrt{3}}{2}}{2}}$

$= \sqrt{\frac{2 + \sqrt{3}}{2} \cdot \frac{1}{2}}$

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

$= \boxed{\frac{1}{2}\sqrt{2 + \sqrt{3}}}$

* ↑ why $-\frac{1}{2}$? b/c in Q2 ↑

$\cos\left(\frac{210}{2}\right) = \pm\sqrt{\frac{1 + \cos 210^\circ}{2}}$

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

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

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

$\tan\left(\frac{210}{2}\right) = \frac{\sin a}{1 + \cos a}$

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

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

$\frac{-1}{2 - \sqrt{3}}$ $\frac{2 + \sqrt{3}}{2 + \sqrt{3}}$

$\boxed{-2 - \sqrt{3}}$

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53. $\sqrt{\frac{1-\cos 6x}{2}}$

$\left|\sin\frac{6x}{2}\right|$

(53) $\boxed{|\sin 3x|}$

65. $5\cos(-5\beta)\cos 3\beta$

$5\left[\frac{1}{2}(\cos(-5\beta-3\beta)+\cos(-5\beta+3\beta))\right]$

$\frac{5}{2}(\cos(-8\beta)+\cos(-2\beta))$

negatives → ? ($\cos$ is even)

$\boxed{\frac{5}{2}\cos(8\beta)+\cos(2\beta)}$

69. $\sin(\theta+\pi)\cos(\theta-\pi)$

$= \frac{1}{2}\left[\sin(\theta+\pi+\theta-\pi)+\sin(\theta+\pi-\theta+\pi)\right]$

(69) $\boxed{\frac{1}{2}\left[\sin(2\theta)+\sin(2\pi)\right]}$

73. $\cos\frac{3\pi}{4}-\cos\frac{\pi}{4}$

$= -2\sin\frac{1}{2}\left(\frac{3\pi}{4}+\frac{\pi}{4}\right)\sin\frac{1}{2}\left(\frac{3\pi}{4}-\frac{\pi}{4}\right)$

(73) $\boxed{-2\sin\frac{\pi}{2}\sin\frac{\pi}{4}}$

77. $\sin(\alpha+\beta)-\sin(\alpha-\beta)$

$= 2\cos\frac{1}{2}(\alpha+\beta+\alpha-\beta)\sin\frac{1}{2}(\alpha+\beta-\alpha+\beta)$

(77) $\boxed{2\cos\alpha\sin\beta}$

89. $\csc 2\theta = \frac{\csc\theta}{2\cos\theta}$

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

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

95. $1+\cos 10y = 2\cos^2 5y$ (reduce power)

$= 2\left(\frac{1+\cos 10y}{2}\right)$

$= 1+\cos 10y$

99. $\frac{\cos 4x+\cos 2x}{\sin 4x+\sin 2x} = \cot 3x$ (sum to product)

$= \frac{2\cos\frac{1}{2}(4x+2x)\cos\frac{1}{2}(4x-2x)}{2\sin\frac{1}{2}(4x+2x)\cos\frac{1}{2}(4x-2x)}$

$= \frac{2\cos 3x\cos x}{2\sin 3x\cos x}$

$= \cot 3x$

101. $\frac{\cos t+\cos 3t}{\sin 3t-\sin t} = \cot t$

$\frac{2\cos\frac{1}{2}(4t)\cos\frac{1}{2}(-2t)}{-2\cos\frac{1}{2}(4t)\sin\frac{1}{2}(2t)}$