F.TF.B.7: Trigonometric Equations 6

1 Find all values of x in the interval $0° < x < 360°$ that satisfy the equation $3\cos x + \sin 2x = 0$.

2 Find all values of θ in the interval $0° \le \theta < 360°$ that satisfy the equation $\cos\theta - \sin 2\theta = 0$.

3 Find all values of θ in the interval $0° \le \theta < 360°$ that satisfy the equation $\sin 2\theta = \sin\theta$.

4 Solve the equation $\cos 2x = \cos x$ algebraically for all values of x in the interval $0° \le x < 360°$.

5 Find all values of θ in the interval $0° \le \theta \le 360°$ which satisfy the equation $\sin\theta - \cos 2\theta = 0$.

6 Find all values of θ in the interval $0° \le \theta < 360°$ that satisfy the equation $\cos 2\theta + 2 = \sin\theta$.

7 In the interval $0° \le A \le 360°$, solve for all values of A in the equation $\cos 2A = -3\sin A - 1$.

8 A solution of the equation $\cos 2\theta + \sin 2\theta = -1$ is
1) 240º
2) 135º
3) 45º
4) −30°

9 Find, to the *nearest ten minutes* or *nearest tenth of a degree*, all values of x in the interval $0° \le x < 360°$ that satisfy the equation $2\sin 2x + \cos x = 0$.

10 Find, to the *nearest degree*, all values of θ in the interval $0° < \theta < 360°$ that satisfy the equation $3\cos 2\theta + \sin\theta - 1 = 0$.

11 Find all values of θ in the interval $0° \le \theta \le 360°$ that satisfy the equation $3\cos 2\theta + 2\sin\theta + 1 = 0$, and round all answers to the *nearest hundredth of a degree*. [Only an algebraic solution can receive full credit.]

12 Find, to the *nearest degree*, all values of θ in the interval $0° \le \theta \le 360°$ which satisfy the equation $3\cos 2\theta + \sin\theta - 2 = 0$.

13 Find all values of θ in the interval $0° \le \theta < 360°$ that satisfy the equation $5\sin\theta + 2\cos 2\theta - 3 = 0$. Express your answer to the *nearest ten minutes* or *nearest tenth of a degree*.

14 Find, to the *nearest degree*, all values of x between 0° and 360° that satisfy the equation $2\sin x + 4\cos 2x = 3$.

15 Find all positive values of θ less than 360° that satisfy the equation $2\cos 2\theta - 3\sin\theta = 1$. Express your answers to the *nearest ten minutes* or *nearest tenth of a degree.*

16 Find all values of θ in the interval $0° \le \theta \le 360°$ that satisfy the equation $\sin\theta = 2 + 3\cos 2\theta$. Express your answer to the *nearest ten minutes* or *nearest tenth of a degree.*

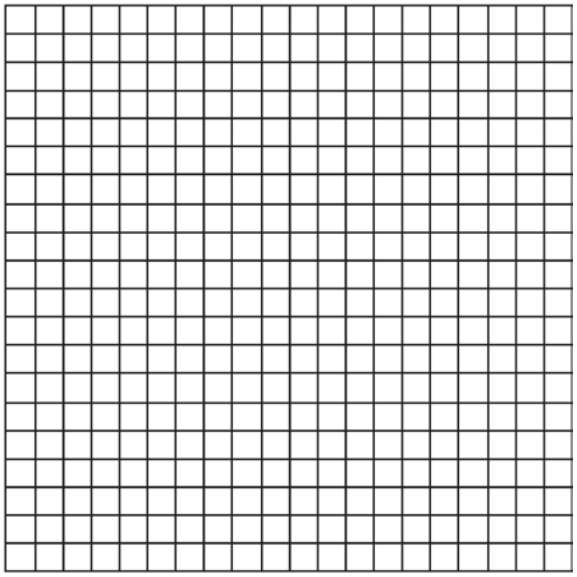
17 Solve the equation $\cos\theta = 2 + 3\cos 2\theta$ for all values of θ, to the *nearest tenth of a degree*, in the interval $0° \le \theta < 360°$.

18 Find, to the *nearest degree*, all values of x in the interval $0° \le x < 360°$ that satisfy the equation $3\cos 2x + \cos x + 2 = 0$

19 Find, to the *nearest ten minutes* or *nearest tenth of a degree*, all values of x in the interval $0° \le x < 360°$ that satisfy the equation $4\cos 2x - 2\cos x + 3 = 0$.

20 Find all values of θ in the interval $0° \le \theta < 360°$ that satisfy the equation $3\cos 2\theta = 7\cos\theta$. Express your answer to the *nearest tenth of a degree or nearest ten minutes*.

21 Find all values of x in the interval $0° \le x < 360°$ that satisfy the equation $3\cos 2x = \cos x + 2$. Express your answers to the *nearest degree*. [The use of the grid is optional.]



F.TF.B.7: Trigonometric Equations 6
Answer Section

1 ANS:

90°, 270°.

$$3\cos x + \sin 2x = 0$$
$$3\cos x + 2\sin x \cos x = 0$$
$$\cos x(3 + 2\sin x) = 0$$
$$\cos x = 0 \quad \text{or} \quad 3 + 2\sin x = 0$$
$$x = \cos^{-1} 0 \quad \text{or} \quad \sin x = -\frac{3}{2}$$
$$x = 90°, 270°$$

REF: 010829b

2 ANS:
30º, 90º, 150º, 270º

REF: 089341siii

3 ANS:
0, 60, 180, 300.

$$\sin 2\theta = \sin \theta$$
$$\sin 2\theta - \sin \theta = 0$$
$$2\sin \theta \cos \theta - \sin \theta = 0$$
$$\sin \theta(2\cos \theta - 1) = 0$$
$$\sin \theta = 0 \quad 2\cos \theta - 1 = 0$$
$$\theta = 0, 180 \quad \cos \theta = \frac{1}{2}$$
$$\theta = 60, 300$$

REF: 061037a2

4 ANS:

$$2\cos^2 x - 1 = \cos x$$
$$2\cos^2 x - \cos x - 1 = 0$$
$$(2\cos x + 1)(\cos x - 1) = 0$$
$$\cos x = -\frac{1}{2}, 1$$
$$x = 0, 120, 240$$

REF: 011638a2

5 ANS:
30º, 150º, 270º

REF: 068541siii

6 ANS:
90º

REF: 088737siii

7 ANS:

210°, 330°. $1-2\sin^2 A=-3\sin A-1$. $-2\sin^2 A+3\sin A+2=0$

$-2x^2+3x+2=0$

$2x^2-3x-2=0$

$(2x+1)(x-2)=0$.

$2x+1=0 \quad x-2=0$

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

$\sin A=-\frac{1}{2} \quad \sin A=2$

$\sin^{-1}(-\frac{1}{2})=-30°$, or $330°$, and $210°$.

$\sin^{-1}(2)$ has no solution

REF: 060131b

8 ANS: 2 REF: 060024siii

9 ANS:
90º, 194.5º, 270º, 345.5º or 90º, 194º30', 270º, 345º30'

REF: 069738siii

10 ANS:

$3\cos 2\theta+\sin\theta-1=0$

$3(1-2\sin^2\theta)+\sin\theta-1=0$

$3-6\sin^2\theta+\sin\theta-1=0$.

$-6\sin^2\theta+\sin\theta+2=0$

$6\sin^2\theta-\sin\theta-2=0$

$6x^2-x-2=0$

$(3x-2)(2x+1)=0$

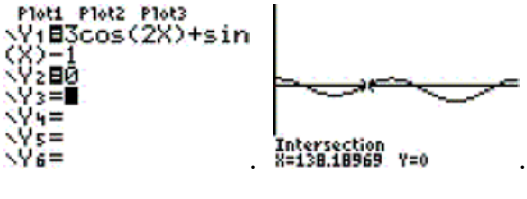
$3x-2=0 \quad 2x+1=0$.

$x=\frac{2}{3} \quad x=-\frac{1}{2}$

$\sin\theta=\frac{2}{3} \quad \sin\theta=-\frac{1}{2}$

$\theta=\sin^{-1}(\frac{2}{3}) \quad \theta=\sin^{-1}(-\frac{1}{2})$.

$\theta\approx 42°, 138° \quad \theta\approx 210°, 330°$

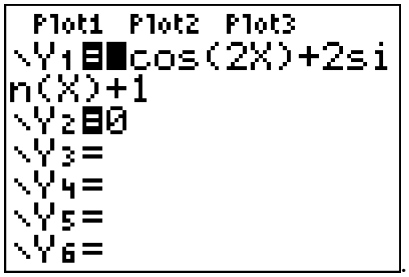


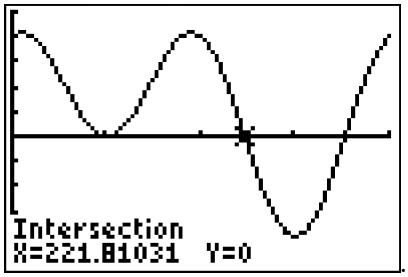
REF: 060530b

11 ANS:

$$3\cos 2\theta + 2\sin\theta + 1 = 0$$
$$3(1 - 2\sin^2\theta) + 2\sin\theta + 1 = 0$$
$$3 - 6\sin^2\theta + 2\sin\theta + 1 = 0$$
$$-6\sin^2\theta + 2\sin\theta + 4 = 0$$
$$3\sin^2\theta - \sin\theta - 2 = 0$$
$$\text{let } \sin\theta = x$$
$$3x^2 - x - 2 = 0$$
$$(3x + 2)(x - 1) = 0$$
$$x = -\frac{2}{3} \text{ or } x = 1$$
$$\sin\theta = -\frac{2}{3} \text{ or } \sin\theta = 1$$
$$\theta = \sin^{-1}(-\frac{2}{3}) \text{ or } \theta = \sin^{-1} 1$$
$$\theta \approx 318.19 \text{ or } 221.81 \text{ or } \theta = 90$$

90°, 221.81°, 318.19°.





REF: 060829b

12 ANS:
30º, 150º, 199º, 341º

REF: 068137siii

13 ANS:
14º30', 90º, 165º30' or 14.5º, 90º, 165.5º

REF: 010437siii

14 ANS:
30, 150, 194, 346

REF: 089539siii

15 ANS:
14.5, 165.5, 270 or 14º30', 165º30', 270º

REF: 019837siii

16 ANS:
56.4º, 123.6º, 270º or 56º30', 123º30', 270º

REF: 060139siii

17 ANS:

$\cos\theta = 2 + 3\cos 2\theta$

$\cos\theta = 2 + 3(2\cos^2\theta - 1)$

$\cos\theta = 2 + 6\cos^2\theta - 3$

$0 = 6\cos^2\theta - \cos\theta - 1$

60, 109.5, 250.5, 300. $0 = 6x^2 - x - 1$

$0 = (3x + 1)(2x - 1)$

$x = -\frac{1}{3} \quad x = \frac{1}{2}$

$\cos\theta = -\frac{1}{3} \quad \cos\theta = \frac{1}{2}$

$\theta \approx 109.5°, 250.5° \quad \theta = 60°, 300°$

REF: 060932b

18 ANS:
71, 120, 240, 289

REF: 069638siii

19 ANS:
60º, 104º30’, 255º30' and 300º or 60º, 104.5º, 255.5º and 300º

REF: 060337siii

20 ANS:
109º30’, 250º30' or 109.5º, 250.5º

REF: 080340siii

21 ANS:

$$3\cos 2x = \cos x + 2$$
$$3(2\cos^2 x - 1) = \cos x + 2$$
$$6\cos^2 x - 3 = \cos x + 2$$
$$6\cos^2 x - \cos x - 5 = 0$$
$$6x^2 - x - 5 = 0$$
$$(6x+5)(x-1) = 0$$
$$x = -\frac{5}{6} \quad x = 1$$

$\cos x = -\frac{5}{6}$

$x = \cos^{-1} -\frac{5}{6}$

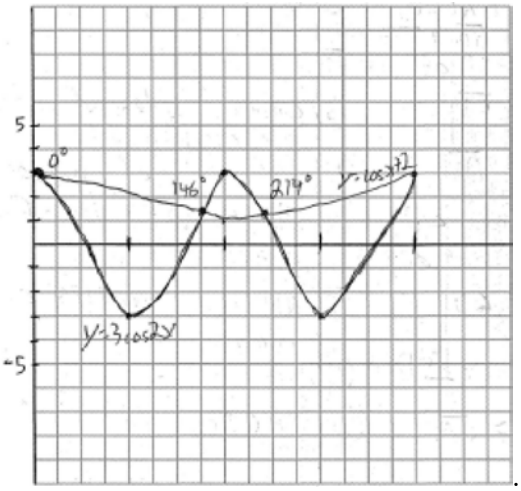
$x \approx 146°, 214°$

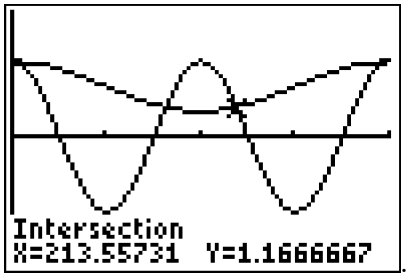
$\cos x = 1$

$x = \cos^{-1} 1.$

$x = 0°$

0°, 146°, 214°.





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