Chapter 5 BLM Answers

BLM 5–1 Chapter 5 Prerequisite Skills

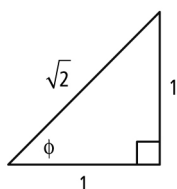**1.**

Degrees	Radians	Revolutions
270	$\dfrac{3\pi}{2}$	$\dfrac{3}{4}$
135	$\dfrac{3\pi}{4}$	$\dfrac{3}{8}$
210	$\dfrac{7\pi}{6}$	$\dfrac{7}{12}$
288	$\dfrac{8\pi}{5}$	$\dfrac{4}{5}$
105.42	1.84	0.29
171	$0.95\pi \approx 2.98$	0.475

2. a) 45° **b)** 80° **c)** 85° **d)** 20°

3. a)

b)

c)

d)

4. a) $\dfrac{1}{2}$ **b)** 1 **c)** $\dfrac{\sqrt{3}}{2}$ **d)** $\sqrt{3}$

5. a) positive **b)** negative
c) negative **d)** negative

6. a) 30°, 150° **b)** 135°, 225°
c) 135°, 315° **d)** 150°, 210°

7. a) quadrant IV **b)** $-\dfrac{2}{\sqrt{5}}$ **c)** $\left(\dfrac{2}{3}, \dfrac{\sqrt{5}}{3}\right)$

8. a)

b) 37° and 323°

9. $\cos\theta = -\dfrac{2\sqrt{2}}{3}$

10. a) 60°; $\dfrac{\pi}{3}$ **b)** $\left(-\dfrac{4}{5}, \dfrac{3}{5}\right)$ **c)** $\left(-\dfrac{3}{5}, -\dfrac{4}{5}\right)$
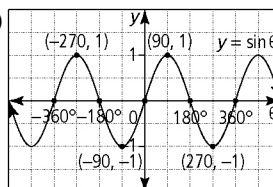
d) θ terminates in quadrant III.

11. a) $\sqrt{3}$ **b)** -1 **c)** undefined

12. a) $x = \pm\dfrac{1}{2}$ **b)** $x = \pm 2\sqrt{3}, x = -\dfrac{5}{3}$
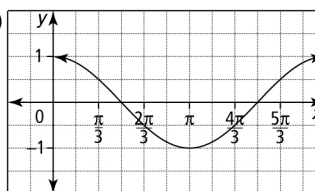
BLM 5–2 Section 5.1 Extra Practice

1. a)

b) $y = -\dfrac{\sqrt{2}}{2}$

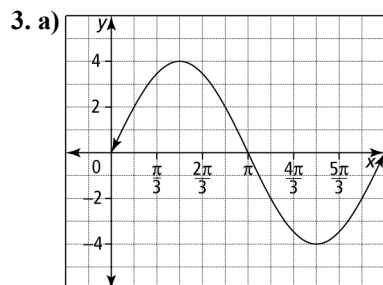**c)** $(-360, 0), (-180, 0), (0, 0), (180, 0), (360, 0)$
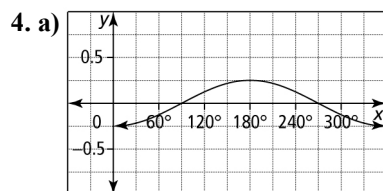
2. a)

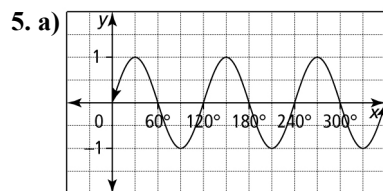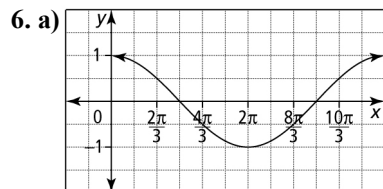**b)** $y = -\dfrac{\sqrt{3}}{2}$

c) $y = -1$

d) $(0, 1)$

3. a)

b) $\{y \mid -4 \le y \le 4, y \in R\}$ **c)** 2π **d)** 4

4. a)

b) $(0, -\frac{1}{4})$ **c)** $\{y \mid -\frac{1}{4} \le y \le \frac{1}{4}, y \in R\}$ **d)** $\frac{1}{4}$

5. a)

b) $120°$ **c)** $\{y \mid -1 \le y \le 1, y \in R\}$ **d)** 1

6. a)

b) $(0, 1)$ **c)** 4π **d)** 1

7. a) amplitude = 4, period = 180° or π

b) amplitude = 3, period = 1800° or 10π

c) amplitude = $\frac{2}{3}$, period = 540° or 3π

d) amplitude = $\frac{1}{4}$, period = 120° or $\frac{2\pi}{3}$

8. a) vertical expansion by a factor of 2, horizontal compression by a factor of $\frac{1}{4}$

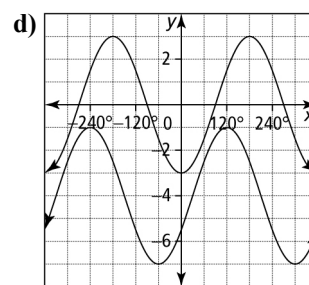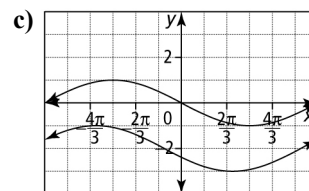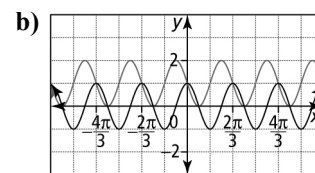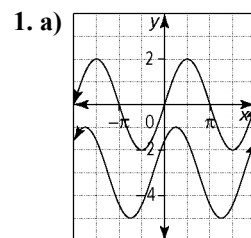**b)** vertical reflection over the *x*-axis, horizontal expansion by a factor of 5

c) vertical reflection over the *x*-axis, vertical expansion by a factor of 3, horizontal compression by a factor of $\frac{2}{5}$

d) vertical expansion by a factor of 5, horizontal reflection over the *y*-axis

9. a) amplitude = $\frac{3}{4}$, period = $\frac{\pi}{3}$ or 60°

b) amplitude = 2, period = $\frac{3\pi}{2}$ or 270°

BLM 5–3 Section 5.2 Extra Practice

1. a)

b)

c)

d)

2. a) phase shift = 25, vertical displacement = 3.2

b) phase shift = $\frac{-\pi}{6}$, vertical displacement = -7

c) phase shift = $\frac{\pi}{8}$, vertical displacement = 5

d) phase shift = $\frac{-2\pi}{3}$, vertical displacement = -1

3. a) period = 180°, range = $\{y \mid -10 \le y \le -2, y \in R\}$

b) period = 6π, range = $\{y \mid -1 \le y \le 5, y \in R\}$

c) period = 72°, range = $\{y \mid 1.9 \le y \le 6.5, y \in R\}$

d) period = $\frac{2\pi}{3}$, range = $\{y \mid -10 \le y \le 4, y \in R\}$

4. period = $\frac{2\pi}{|b|}$,

range = $\{y \mid d - |a| \le y \le d + |a|, y \in R\}$

5. a) $y = 3 \sin 4\left(x - \frac{\pi}{2}\right) + 5$ **b)** $y = \frac{1}{2} \sin 3(x + 50°) - 4$

c) $y = \sin \frac{1}{4}\left(x - \frac{\pi}{2}\right)$ **d)** $y = \sin \frac{2}{3}x + 2$

6. Example: $y = 3 \sin 2\left(x + \frac{\pi}{4}\right)$

7. a) 5 **b)** -4 **c)** $\frac{2\pi}{3}$ **d)** $y = 5 \cos 3x - 4$

e) $y = 1$ for $x = 0$, $\dfrac{2\pi}{3}$, $\dfrac{4\pi}{3}$, 2π

f) $y = -9$ for $x = \dfrac{\pi}{3}$, π, $\dfrac{5\pi}{3}$
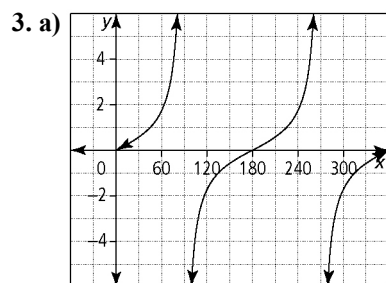
8. Example: $y = 3 \sin 6(x - 105°) + 7$

BLM 5–4 Section 5.3 Extra Practice

1. a) $\theta = 0$, $\theta = \pi$, $\theta = 2\pi$ **b)** $\theta = \dfrac{\pi}{4}$, $\theta = \dfrac{5\pi}{4}$

c) $\theta = \dfrac{3\pi}{4}$, $\theta = \dfrac{7\pi}{4}$ **d)** $\theta = \dfrac{\pi}{2}$, $\theta = \dfrac{3\pi}{2}$
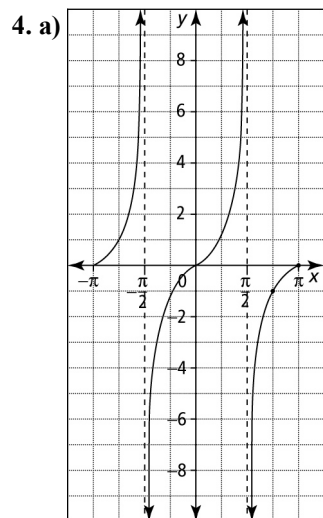
2. a) $\dfrac{1}{\sqrt{3}}$ **b)** 1 **c)** $\sqrt{3}$ **d)** undefined **e)** $-\sqrt{3}$

f) -1 **g)** $\dfrac{-1}{\sqrt{3}}$ **h)** 0

3. a)

b) $\{x \mid 0° \le x \le 360°, x \in R, x \ne 90° \text{ or } 270°\}$

c) $\{y \mid y \in R\}$ **d)** $180°$
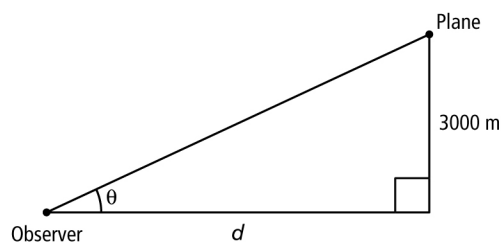
4. a)

b) $(-\pi, 0)$, $(0, 0)$, $(\pi, 0)$ **c)** $x = \pm\dfrac{\pi}{2}$ **d)** 0

5. No, because it does not have maximum and minimum values.

6. asymptotes: $x = 90° + 180°n$, $n \in I$;
domain: $\{x \mid x \ne 90° + 180°n, x \in R, n \in I\}$

7. a)

b) $d = \dfrac{3000}{\tan \theta}$ **c)** $\theta = 90°$, $d = 0$

8. a) $x = n\pi$, $n \in I$ **b)** at $x = \dfrac{\pi}{2} + n\pi$, $n \in I$

c) $\{x \mid x \ne \dfrac{\pi}{2} + n\pi, x \in R, n \in I\}$ **d)** $\{y \mid y \in R\}$

9. a) 0 **b)** -1 **c)** 1 **d)** undefined

BLM 5–6 Section 5.4 Extra Practice

1. $x = 21°$, $159°$, $201°$, and $339°$

2. a) domain: $\{t \mid t \ge 0, t \in R\}$
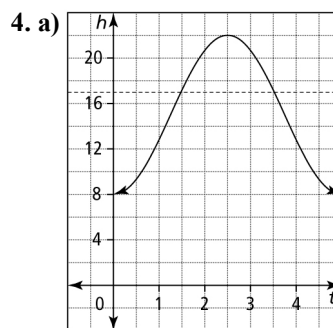range: $\{h \mid 2 \le h \le 28, h \in R\}$
period: 0.7 m
b) domain: $\{t \mid t \ge 0, t \in R\}$
range: $\{F \mid 500 \le F \le 1500, F \in R\}$
period: 24 foxes

3. a) $T(x) = 3.808 \cos \dfrac{2\pi}{365} (x + 10) + 6.375$

b) $T(x) = -3.875 \cos \dfrac{2\pi}{365} (x + 10) + 18.875$

4. a)

b) $b(t) = -7 \cos \dfrac{2\pi}{5} t + 15$

c) $b(4) = 12.8$ m

d) $3.52 - 1.48 = 2.04$ s

5. a) $T(d) = 20 \cos \dfrac{2\pi}{365} (d - 201) + 4$

b) 23.3 °C **c)** 76 days

6. a) $h(t) = 2 \cos \pi t + 18$

b) $h(t) = 2 \sin \pi(t - 1.5) + 18$
or $h(t) = -2 \sin \pi (t - 0.5) + 18$

BLM 5–8 Chapter 5 Test

1. C

2. D

3. D

4. A

5. $y = 11 \sin\left(\dfrac{2\pi}{3}t\right) + 19$

6. $y = 2 \cos \dfrac{1}{3}(x + \pi) - 3$

7. amplitude: 5; range: $\{y \mid -8 \le y \le 2, y \in R\}$

8. a) $y = 2\cos x$ and $y = 1$

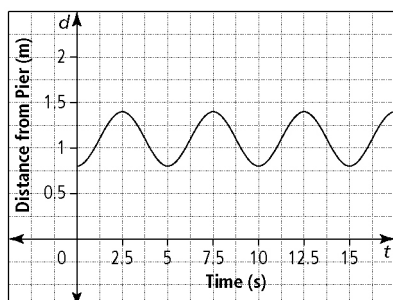**b)** $2\cos x = 1$; $x = 60° \pm 360n$, $n \in I$, and $x = 300° \pm 360n$, $n \in I$

9. a) $x = \dfrac{\pi}{2} + n\pi$, $n \in I$

b) domain: $\{\theta \mid \theta \ne \dfrac{\pi}{2} + n\pi, \theta \in R, n \in I\}$

range: $\{y \mid y \in R\}$

10. a) period **b)** b **c)** Observer B

11. a)

b) amplitude is 0.3 m, period is 5 s

c) Ensure that answers are accompanied by an explanation. Example: Cosine curve may not have a phase shift if you consider a negative a value (that is, a reflection in the x-axis).

d) $d = 0.3 \sin \dfrac{2\pi}{5}\left(t - \dfrac{5}{4}\right) + 1.1$

e) 1.4 s

f) $d = -0.3 \cos \dfrac{2\pi}{5} t + 1.1$; Both equations model the same graph, so the result of the calculation would be the same.

12. a) amplitude, horizontal phase shift

b) period or b value, and horizontal central axis or d value

c) $f(x) = 6 \cos 3x + 6$, $g(x) = 6 \cos x + 2$