

Additional ch. 13 Review

(1) a) $y = 1 + \sin x$ b) $y = -2 \cos 3x$ c) $y = 5 \sin x - 3$ d) $y = \frac{1}{3} \cos x + 1$
 VS=1 A=1 A=2 VS=-3 A=5 VS=1 A=1/3
 max: 2 min: 0 max: 2 min: -2 max: 2 min: -8 max: 4/3 min: 2/3

(2) (a) right π , up 1 (c) \uparrow compress $1/3$
 (b) V flip over x-axis, V stretch of 2

(3) VS^{shift} none B = 2 cycles
 Amp - 4 or period = π $\frac{2\pi}{B} = \pi$ B = 2
 Since no HShift \rightarrow vertical flip

$y = -4 \cos 2x$

(4) If $(2\pi, 2)$ is on the function, it will be true.

$2 = 2 \cos(2\pi/2) + 4$

$2 = 2 \cos \pi + 4$

$2 = 2(-1) + 4$

$2 = -2 + 4$

$2 = 2$ ✓

$(-1, 0)$
 cos, sin

(5) (a) $2 \sin(3x) = \sqrt{2}$

$\sin 3x = \sqrt{2}/2$

$\sin \theta = \sqrt{2}/2$

Ref $\theta = \pi/4$ (S/A)

$\theta = \pi/4, 3\pi/4, 9\pi/4, 11\pi/4, 17\pi/4, 19\pi/4$

$3x = \pi/4, 3\pi/4, 9\pi/4, 11\pi/4, 17\pi/4, 19\pi/4$

$x = \pi/12, 3\pi/12, 9\pi/12, 11\pi/12, 17\pi/12, 19\pi/12$

(b) $4 \sin^2 x = 1$

$\sin^2 x = 1/4$

$\sin x = \pm 1/2$

Ref $\theta = \pi/6$ S/A

$\pi/6, 5\pi/6, 7\pi/6, 11\pi/6$

(c) $\cos(x + 2\pi/3) = 1/2$

$\cos \theta = 1/2$

Ref $\theta = \pi/3$ S/A

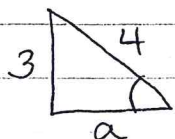
$\theta = \pi/3, 5\pi/3, 7\pi/3, 11\pi/3$

$x + 2\pi/3 = \pi/3, 5\pi/3, 7\pi/3, 11\pi/3$

$x = -\pi/3, 3\pi/3, 5\pi/3, 9\pi/3$

$x = \pi, 5\pi/3$

6) $\sin x = -3/4$ $\frac{S}{A} = \frac{C}{C}$



$$a^2 + 3^2 = 4^2$$

$$a = \sqrt{7}$$

$$\cos x = -\sqrt{7}/4$$

or

$$\sin^2 x + \cos^2 x = 1$$

$$(-3/4)^2 + \cos^2 x = 1$$

$$9/16 + \cos^2 x = 1$$

$$\cos^2 x = 7/16 \quad \cos x = -\sqrt{7}/4$$

$$\sin 2x = 2 \sin x \cos x = 2(-3/4)(-\sqrt{7}/4) = 6\sqrt{7}/16 = \boxed{3\sqrt{7}/8}$$

7) a) $\cos^3 x + \sin^2 x \cos x = \cos x$
 $\cos x (\cos^2 x + \sin^2 x) = \cos x$
 $\cos x (1) = \cos x$
 $\cos x = \cos x$ ✓

b) $5 - 5 \sin^2 x = 5 \cos^2 x$
 $5(1 - \sin^2 x) = 5 \cos^2 x$
 $5 \cdot \cos^2 x = 5 \cos^2 x$ ✓

c) $(\cos x - \sin x)^2 = 1 - \sin 2x$
 $\cos^2 x - 2 \cos x \sin x + \sin^2 x = 1 - \sin 2x$
 $(\sin^2 x + \cos^2 x) - 2 \sin x \cos x = 1 - \sin 2x$
 $1 - \sin 2x = 1 - \sin 2x$

d) $\frac{4 \sin^2 x - 4}{8 \cos x} = -\frac{\cos x}{2}$

$$\frac{4(\sin^2 x - 1)}{8 \cos x} = -\frac{\cos x}{2}$$

$$\frac{4(1 - \cos^2 x - 1)}{8 \cos x} = -\frac{\cos x}{2}$$

$$\frac{-4 \cos^2 x}{8 \cos x} = -\frac{\cos x}{2}$$

$$\frac{-\cos^2 x}{2} = -\frac{\cos x}{2}$$
 ✓

e) $\frac{\sin 2x - \sin x}{\cos 2x - \cos x + 1} = \tan x$

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

$$\frac{\sin x (2 \cos x - 1)}{2 \cos^2 x - \cos x} = \tan x$$

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

$$\frac{\sin x}{\cos x} = \tan x \rightarrow \boxed{\tan x = \tan x}$$

8) a) initial population $\rightarrow t=0$

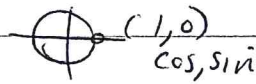
$$P(t) = 5 + 2 \sin\left(\frac{\pi}{3} \cdot 0\right)$$

$$P(t) = 5 + 2 \sin 0$$

$$P(t) = 5 + 2(0)$$

$$P(t) = 5 + 0$$

$$P(t) = 5 \rightarrow 5,000 \text{ beetles}$$



b) smallest = min vertical shift 5 3,000 smallest
largest = max Amp 2 3,000 largest

c) $t=2$

$$P(t) = 5 + 2 \sin\left(\frac{\pi \cdot 2}{3}\right)$$

$$P(t) = 5.0731 \dots = 5073 \text{ beetles}$$

d) graph $y = 5 + 2 \sin\left(\frac{\pi x}{3}\right)$
 $y = 6$

intersect : 2.5

2½ weeks