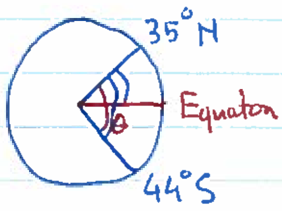
Test 2 Review Solution

① Easy

②



$\theta = 35° + 44° = 79°.$

Convert to radian: $\theta = 79° \cdot \frac{\pi}{180°} = \frac{79\pi}{180}$

Distance between 2 cities $= R \cdot \theta = (6400) \cdot \left(\frac{79\pi}{180}\right) \simeq \boxed{8824}$

③ $s = R \cdot \theta \longrightarrow R = \frac{s}{\theta} = \frac{42.2}{(109.38) \cdot \left(\frac{\pi}{180}\right)} \approx \boxed{22.11}$

④ $A = \frac{1}{2} R^2 \cdot \theta \longrightarrow R^2 = \frac{2A}{\theta} \longrightarrow R = \sqrt{\frac{2A}{\theta}}$

$\longrightarrow R = \sqrt{\frac{2 \cdot 93}{\frac{\pi}{3}}} \simeq \boxed{13.33}$

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⑦ $w = 44 \cdot 2\pi = 88\pi.$

$v = Rw = \left(\frac{21}{2}\right) \cdot 88\pi \simeq \boxed{2903}$

⑧ $y = \frac{1}{2} \cos\left(\frac{1}{3}x\right) \longrightarrow$ Amplitude $= \boxed{\frac{1}{2}}$ Period $= \frac{2\pi}{\frac{1}{3}} = \boxed{6\pi}$

So, the only correct graph is C.

(9) The graph corresponds to $y = a\sin(bx)$

Amplitude $= 5$. So, $a = 5$

Period $= \pi$. So, $\frac{2\pi}{b} = \pi$. So, $b = \frac{2\pi}{\pi} = 2$.

So, $\boxed{y = 5\sin(2x)}$

(10) The graph is a translation of a basic curve so it is either $y = \sin(x-d)$ or $y = \cos(x-d)$.

It is cosine translated to the right so $y = \cos(x-d)$

The translated amount is $\frac{\pi}{3}$ (b/c it is $> \frac{\pi}{4}$).

So, $y = \cos\left(x - \frac{\pi}{3}\right)$

(11) The graph is the graph of secant (V.A. are at $\pm\frac{\pi}{2}$). It is shifted down by 4 units.

So, $y = -4 + \sec x$

(12) This is a sine function so the time between the largest and smallest population is half of a period.

The period is $\frac{2\pi}{b} = \frac{2\pi}{\frac{2}{5}} = 5\pi$. So, half period is $\frac{5\pi}{2} \simeq 8$ years

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(14) $A = \frac{1}{2}R^2\theta \longrightarrow 18 = \frac{1}{2}R^2\theta \rightarrow R^2\theta = 36$

$s = R\cdot\theta \longrightarrow 3 = R\cdot\theta$.

From the second equation: $R = \frac{3}{\theta}$. Substitute this to the first equation, we get:

$$\left(\frac{3}{\theta}\right)^2\cdot\theta = 36 \longrightarrow \frac{9}{\theta^{\boxed{2}}}\cdot\theta^1 = 36 \longrightarrow \frac{9}{\theta} = 36$$

$$\longrightarrow 9 = 36\theta \rightarrow \theta = \frac{1}{4}\text{ (radian)} \rightarrow \theta \simeq \boxed{14^\circ}$$

(15) $\sin(s) = \frac{1}{1.1691} \longrightarrow s = \sin^{-1}\left(\frac{1}{1.1691}\right) \simeq 1.0262$ (rad)

(16) $2\cos^2(s) = 1$. So, $\cos^2(s) = \frac{1}{2}$.

So, $\cos(s) = \frac{\sqrt{2}}{2}$ or $\cos(s) = -\frac{\sqrt{2}}{2}$

From the unit circle, the values of s in $[0, 2\pi)$ that satisfy the above are: $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$.

But the problem asks for s in $[-\pi, \pi)$. So, we need to find the coterminal angles of $\frac{5\pi}{4}$ and $\frac{7\pi}{4}$.

They are: $\frac{5\pi}{4} - 2\pi = -\frac{3\pi}{4}$, $\frac{7\pi}{4} - 2\pi = -\frac{\pi}{4}$.

Solutions in $[-\pi, \pi)$ are: $-\frac{3\pi}{4}, -\frac{\pi}{4}, \frac{\pi}{4}, \frac{3\pi}{4}$.

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18 e = voltage $\rightarrow$ Set $e = 10\sqrt{2}$.

So, $20 \sin\left(\frac{\pi t}{4} - \frac{\pi}{2}\right) = 10\sqrt{2}$.

So, $\sin\left(\frac{\pi t}{4} - \frac{\pi}{2}\right) = \frac{10\sqrt{2}}{20} = \frac{\sqrt{2}}{2}$.

So, $\frac{\pi t}{4} - \frac{\pi}{2} = \frac{\pi}{4} \rightarrow \frac{\pi t}{4} = \frac{\pi}{4} + \frac{\pi}{2} = \frac{3\pi}{4}$.

$\rightarrow t = \frac{3\pi/4}{\pi/4} = \boxed{3}$

19 Amplitude $= |a| = 4$.

This is cosine "flipped", so $a = -4$.

Period $= \frac{2\pi}{b} = \pi$. So, $b = \frac{2\pi}{\pi} = 2$.

So, $y = -4\cos(2x)$

20 Easy. Just find sine and cosine from coordinates.

$\tan\theta = \frac{\sin\theta}{\cos\theta}$. Then use the reciprocal identities.