3. 12.

$x = a\sin\omega t$, $y = a\sin 2\omega t$

$x = a\sin\omega t$, $y = a\cos 2\omega t$

$y(x) - ?$

$\sin\omega t = \frac{x}{a}$

$\begin{cases} x = a\sin\omega t \\ y = a\sin 2\omega t = a2\sin\omega t\cos\omega t \end{cases}$

~~$y = a2\sin\omega t\cos\omega t$~~

$\frac{x}{y} = \frac{a\sin\omega t}{a2\sin\omega t\cos\omega t}$

$\frac{x}{y} = \frac{1}{2\cos\omega t} \Rightarrow \cos\omega t = \frac{y}{2x}$

$\sin\omega t = \frac{x}{a}$

$\cos\omega t^2 + \sin\omega t^2 = \left(\frac{y}{2x}\right)^2 + \left(\frac{x}{a}\right)^2$

$1 = \frac{y^2}{4x^2} + \left(\frac{x}{a}\right)^2$

$1 = \frac{y^2a^2 + 4x^4}{4x^2a^2} \Rightarrow y^2 = \frac{4x^2(a - x^2)}{a^2}$

а) Ответ: $y^2 = 4x^2\left(\frac{a - x^2}{a^2}\right) = 4x^2\left(1 - \frac{x^2}{a^2}\right)$

б) $\begin{cases} x = a\sin\omega t \Rightarrow \sin\omega t = \frac{x}{a} \\ y = a\cos 2\omega t = a(\cos^2\omega t - \sin^2\omega t) = a(1 - 2\sin^2\omega t) \end{cases}$

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

3. 180.

$\xi = 60\cos(1800t - 5,3x)$

$\frac{a}{\lambda} - ?$

$\frac{v_m}{v} - ?$

$\omega = 1800$

$k = 5,3$

$a = 60 \cdot 10^{-6}$ м

Ур-ие плоской волны: $u(x,t) = a\cos(\omega t - \frac{2\pi x}{\lambda})$

$\lambda = \frac{2\pi}{k} = \frac{6,28}{5,3} = 1,18$ м

а) $\frac{a}{\lambda} = \frac{60 \cdot 10^{-6}}{1,18} = 5,1 \cdot 10^{-5}$

б) $v = \frac{d\xi}{dt} = -a\omega\sin(\omega t - kx)$

Амп. v частиц среды: $v_m = a\omega = 108 \cdot 10^3$ м/с

$v = \frac{\omega}{k}$, $\frac{v_m}{v} = \frac{A\omega k}{\omega} = Ak = 60 \cdot 10^{-6} \cdot 5,3$

6. 45.

$R = 30$ см

$T - ?$

~~7.~~ 4

$\vartheta = 0,5$

$A = 0,2$

$\lambda = 0,1$

$v - ?$

$\xi_{max} -$

6.45

$R = 30$ см

$T - ?$

$$T = 2\pi\sqrt{\frac{J_1}{mgd}} \qquad d = R$$

$$J_1 = J_c + md^2 = \frac{mR^2}{2} + mR^2 = \frac{3mR^2}{2}$$

$$J_c = \frac{mR^2}{2}$$

$$T = 2\pi\sqrt{\frac{3mR^2}{2mgR}} = 2\pi\sqrt{\frac{3R}{2g}} = 2 \cdot 3{,}14\sqrt{\frac{3 \cdot 0{,}3}{2 \cdot 10}} = 1{,}35$$

7.4

$\nu = 0{,}5 \cdot 10^{3}$ Гц

$A = 0{,}25$ мм

$\lambda = 0{,}7$ м

$v - ?$

$\xi_{max} - ?$

$$\lambda = vT = \frac{v}{\nu} \Rightarrow v = \lambda\nu = 0{,}7 \cdot 500 = 350 \text{ м/с}$$

$$\xi_{max} = Aw = A \cdot 2\pi\nu = 0{,}25 \cdot 10^{-2} \cdot 2 \cdot 3{,}14 \cdot 500 = 7{,}85 \frac{м}{с}$$