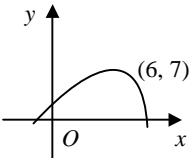
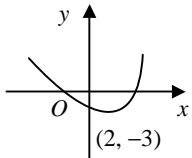
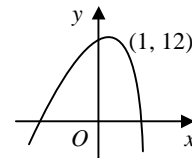
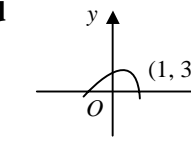
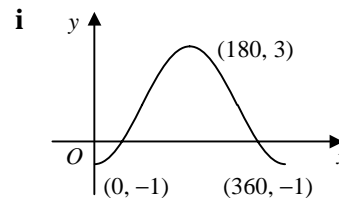
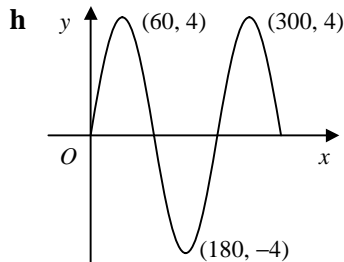
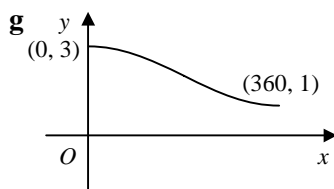
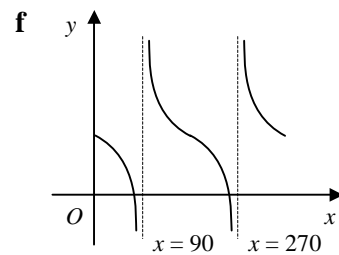
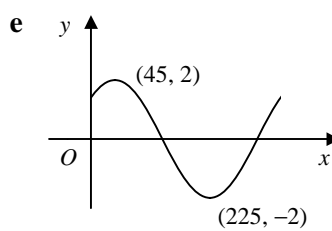
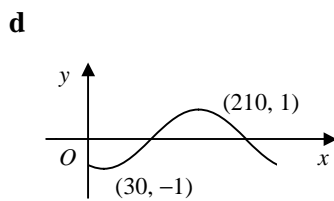
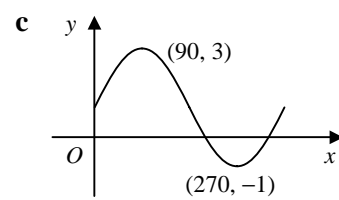
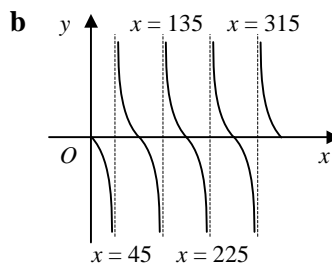
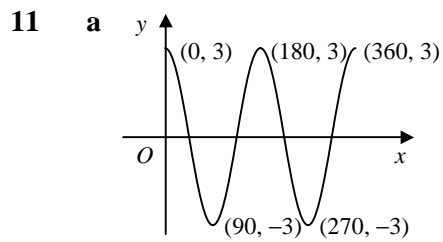
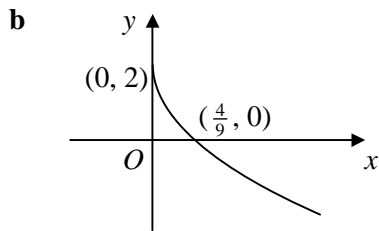


Note: For this worksheet especially, there may be alternative correct answers

- 1**
- a** translated 3 units in negative x -direction and translated 2 units in positive y -direction
 - b** reflected in the y -axis and stretched by a factor of 2 in y -direction
 - c** translated 1 unit in positive x -direction and stretched by a factor of 3 in y -direction
 - d** reflected in the x -axis and then translated 4 units in positive y -direction
- 2**
- a** $= (x + 3)^2 - 9 + 2 = (x + 3)^2 - 7$
 - b** translation by 3 units in negative x -direction and translation by 7 units in negative y -direction
- 3**
- a** $y = 2[2(x - 3) + 7] \Rightarrow y = 4x + 2$
 - b** $y = 2[3e^{(x-3)}] \Rightarrow y = 6e^{x-3}$
 - c** $y = 2[(x - 3)^2 - 3(x - 3) + 1] \Rightarrow y = 2x^2 - 18x + 38$
 - d** $y = 2\left[\frac{1}{(x-3)}\right] \Rightarrow y = \frac{2}{x-3}$
- 4**
- a** stretch by a factor of $\frac{1}{3}$ in x -direction and reflection in the x -axis (either first)
 - b** reflection in the y -axis and translation by 5 units in positive y -direction (either first)
 - c** translation by 4 units in negative x -direction and stretch by a factor of 3 in y -direction (either first)
 - d** stretch by a factor of 3 in y -direction, then translation by 2 units in positive y -direction
- 5**
- a** 
 - b** 
 - c** 
 - d** 
- 6**
- first $\Rightarrow y = (x + 2)^2 + 4(x + 2) - 2 \Rightarrow y = x^2 + 8x + 10$
 - second $\Rightarrow y = 3[x^2 + 8x + 10] \Rightarrow y = 3x^2 + 24x + 30$
 - third $\Rightarrow y = 3(-x)^2 + 24(-x) + 30 \Rightarrow y = 3x^2 - 24x + 30$
- 7**
- a** $= 2[x^2 - 2x] + 7 = 2[(x - 1)^2 - 1] + 7 = 2(x - 1)^2 + 5$
 - b** translation by 5 units in negative y -direction, then stretch by a factor of $\frac{1}{2}$ in y -direction, then translation by 1 unit in negative x -direction
- 8**
- a** $f'(x) = 3x^2 - 6x$
 SP: $3x^2 - 6x = 0$
 $3x(x - 2) = 0$
 $x = 0, 2$
 $\therefore (0, 4)$ and $(2, 0)$
 - b i** $(0, -8)$ and $(2, 0)$ **ii** $(0, 7)$ and $(4, 3)$ **iii** $(2, 1)$ and $(4, 0)$

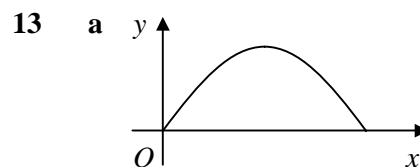
- 9 a stretch by factor of 3 in y-direction,
then reflection in x-axis,
then translation by 2 units in +ve y-dir'n

- 10 a 180°
b $(0, 1)$
c $(90, 3)$ and $(270, 3)$



- 12 a 60°
b $\frac{360^\circ}{k}$

- 14 a max. value 4 $\therefore a = 4$
max. occurs at $x = 45 \therefore b = 2$
b $(135, -4)$



- b $(\pi, 2)$
c $2 \sin \frac{1}{2}x = \sqrt{2}$
 $\sin \frac{1}{2}x = \frac{1}{\sqrt{2}}$
 $\frac{1}{2}x = \frac{\pi}{4}, \pi - \frac{\pi}{4}$
 $= \frac{\pi}{4}, \frac{3\pi}{4}$
 $x = \frac{\pi}{2}, \frac{3\pi}{2}$