

Are you ready to start ME35?

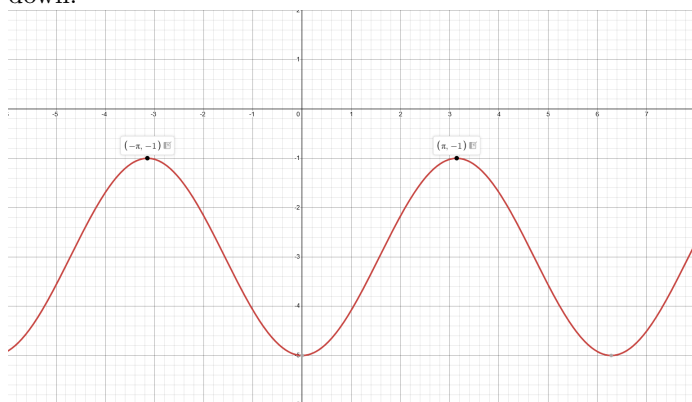
Self-Assessment Test — Answer Key

1. (a) For the function $h(x) = \frac{1}{x-2} + 3$:
- (i) Domain: $x \in \mathbb{R}, x \neq 2$; Range: $y \in \mathbb{R}, y \neq 3$
- (ii) $h^{-1}(x) = \frac{1}{x-3} + 2$; Domain: $x \neq 3$; Range: $y \neq 2$



- (iii)
2. (a) Horizontal translation 3 units right; vertical compression by factor $\frac{1}{2}$; reflection in the x -axis; vertical translation 4 units up.
Horizontal asymptote: $y = 4$; y -intercept: $\left(0, \frac{63}{16}\right)$
- (b) $x = 2$
- (c) Car depreciation:
- (i) $V = 28\,000(0.85)^t$
- (ii) $V \approx \$12\,424$
- (iii) Year 7
- (d) $PV \approx \$13\,536.79$
3. (a) Point $P(-5, 12)$ on terminal arm:
- (i) $r = 13$
- (ii) $\sin \theta = \frac{12}{13}, \quad \cos \theta = -\frac{5}{13}, \quad \tan \theta = -\frac{12}{5}$
- (iii) $\theta \approx 113^\circ$
- (b) CAST rule:
- (i) Quadrant II
- (ii) $\theta \in (90^\circ, 180^\circ) \cup (270^\circ, 360^\circ)$

4. (a) For $y = -3 \sin\left(2\left(x - \frac{\pi}{4}\right)\right) + 1$:
- (i) Amplitude: 3
 - (ii) Period: π
 - (iii) Phase shift: $\frac{\pi}{4}$ to the right
 - (iv) Vertical shift: 1 unit up
 - (v) Maximum: 4; Minimum: -2
- (b) $y = 4 \sin\left(2\left(x - \frac{\pi}{6}\right)\right) - 2$
- (c) Vertical stretch by factor 2; horizontal translation π units left; vertical translation 3 units down.



- (d) Solve for $x \in [0, 2\pi)$:
- (i) $x = \frac{\pi}{3}, \frac{5\pi}{3}$
 - (ii) $x = 0, \frac{\pi}{2}, \pi$
 - (iii) $x = \frac{\pi}{3}, \pi, \frac{5\pi}{3}$
5. (a) Classify sequences:
- (i) Arithmetic; $d = 4$; $t_n = 4n + 3$
 - (ii) Geometric; $r = 2$; $t_n = 3(2)^{n-1}$
 - (iii) Neither
- (b) Recursive sequence $t_1 = 3$, $t_n = 2t_{n-1} - 1$:
- (i) 3, 5, 9, 17, 33
 - (ii) $t_7 = 129$
 - (iii) Neither (differences double each time; ratios are not constant)