7. The following functions have the rule $f(x) = a \cos b(x - h) + k$.
Find the zeros of each function over

1. the interval $[h, h + p]$ where p is the period of the function.
2. the set of all real numbers.

a) $f(x) = 2\cos\frac{\pi}{6}(x-2)+1$

$\cos\frac{\pi}{6}(x-2) = -\frac{1}{2}$

$\frac{\pi}{6}(x-2) = \frac{2\pi}{3}$ or $\frac{\pi}{6}(x-2) = \frac{4\pi}{3}$

$x = 6$ or $x = 10$

1. $S = \{6, 10\}$
2. $S = \{6 + 12n\} \cup \{10 + 12n\}$

b) $f(x) = -2\cos\frac{\pi}{3}(x+1)+\frac{1}{2}$

$\cos\frac{\pi}{3}(x+1) = \frac{1}{4}$

$\frac{\pi}{3}(x+1) = 1.32$ or $\frac{\pi}{3}(x+1) = 4.97$

$x = 0.26$ or $x = 3.75$

1. $S = \{0.26; 3.75\}$
2. $S = \{0.26 + 6n\} \cup \{3.75 + 6n\}$

c) $f(x) = \cos 2(x - \pi) + 1$

$\cos 2(x - \pi) = -1$

$2(x - \pi) = \pi$

$x = \frac{3\pi}{2}$

1. $S = \left\{\frac{3\pi}{2}\right\}$
2. $S = \left\{\frac{3\pi}{2} + \pi n\right\}$

d) $f(x) = 2\cos\left(x + \frac{\pi}{2}\right) - \sqrt{3}$

$\cos\left(x + \frac{\pi}{2}\right) = \frac{\sqrt{3}}{2}$

$x + \frac{\pi}{2} = \frac{\pi}{6}$ or $x + \frac{\pi}{2} = \frac{11\pi}{6}$

$x = -\frac{\pi}{3}$ or $x = \frac{4\pi}{3}$

1. $S = \left\{\frac{-\pi}{3}, \frac{4\pi}{3}\right\}$
2. $S = \left\{\frac{-\pi}{3} + 2\pi n\right\} \cup \left\{\frac{4\pi}{3} + 2\pi n\right\}$

e) $f(x) = -3\cos\frac{\pi}{4}x + 6$

$\cos\frac{\pi}{4}x = 2$

1. $S = \varnothing$
2. $S = \varnothing$

f) $f(x) = -2\cos\frac{\pi}{8}(x+2) - \sqrt{2}$

$\frac{\pi}{8}(x+2) = \frac{3\pi}{4}$ or $\frac{\pi}{8}($

$\frac{\pi}{8}(x+2) = \frac{3\pi}{4}$ or $\frac{\pi}{8}(x+2) = \frac{5\pi}{4}$

$x = 4$ $x = 8$

1. $S = \{4, 8\}$
2. $S = \{4 + 16n\} \cup \{8 + 16n\}$

8. Determine the zeros of the function $f(x) = -2\cos\frac{\pi}{12}(x+5) - 1$ over the interval $[66, 126]$.

$\cos\frac{\pi}{12}(x+5) = -\frac{1}{2}$

$\frac{\pi}{12}(x+5) = \frac{2\pi}{3}$ or $\frac{\pi}{12}(x+5) = \frac{4\pi}{3}$

$x = 3$ or $x = 11$

The zeros over the interval [66, 126] are 75, 83, 99, 107, 123.