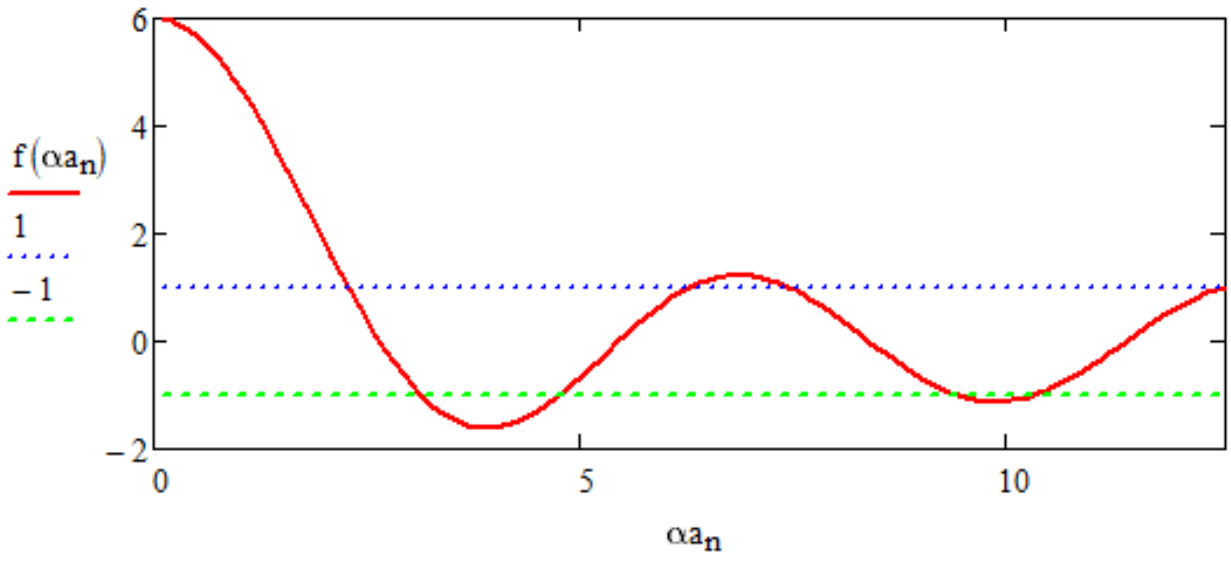
3.6 Repeat Problem 3.5 for the function $f(\alpha a) = 5(\sin \alpha a)/\alpha a + \cos \alpha a = \cos ka$.

3.5 (*a*) Plot the function $f(\alpha a) = 12(\sin \alpha a)/\alpha a + \cos \alpha a$ for $0 \le \alpha a \le 4\pi$. Also, given the function $f(\alpha a) = \cos ka$, indicate the allowed values of αa that will satisfy this equation. (*b*) Determine the values of αa at (*i*) $ka = \pi$ and (*ii*) $ka = 2\pi$.

Using MathCad

a) $f(aa) := \dfrac{5 \cdot \sin(aa)}{aa} + \cos(aa)$ $\quad n := 1 .. 120$ $\quad \alpha a_n := \dfrac{4 \cdot \pi \cdot n}{120}$

Plot $f(\alpha a)$. Then, since -1<= cos(*ka*) <= 1, plot horizontal lines at +1 & -1



By zooming in on plot & trial-and-error, find αa bands where -1<= *f* (αa) <= 1.

first band of αa	$f(0.727164\pi) = 1$	to	$f(\pi) = -1$
second band of αa	$f(1.515565\pi) = -1$	to	$f(2\pi) = 1$
third band of αa	$f(2.37576\pi) = 1$	to	$f(3\pi) = -1$
fourth band of αa	$f(3.28706\pi) = -1$	to	$f(4\pi) = 1$

b)

(i) Since cos(*ka* = π) = -1, the values αa w/in the range are:
π, $1.515565\pi = 4.76129$, 3π, & $3.28706\pi = 10.32660$.

(ii) Since cos(*ka* = 2π) = 1, the values αa w/in the range are:
$0.727164\pi = 2.284453$, 2π, $2.37576\pi = 7.46367$, & 4π.