

# Further mathematics for economists<sup>1</sup>

## Exercise Sheet 5 - Trigonometry

1. Use the formulae for  $\sin(\alpha + \beta)$  and  $\cos(\alpha + \beta)$  to show that

(a)  $\sin 2\alpha = 2 \sin \alpha \cos \alpha$

(b)  $\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha$

(c)  $\sin 3\alpha = 3 \sin \alpha - 4 \sin^3 \alpha$

2. Show that

$$y = A \sin mx + B \cos mx$$

satisfies the differential equation

$$\frac{d^2y}{dx^2} + m^2y = 0$$

3. Let  $f(x) = 5 \cos x + 12 \sin x$ . Find a positive number  $R$  and an acute angle  $\alpha$  such that

$$f(x) = R \cos(x - \alpha)$$

for all  $x$ .

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<sup>1</sup>Material to the course: <http://www.staff.city.ac.uk/c.f.m.faria/furthermaths.html>