TRINITY COLLEGE

Year 11 Mathematics Specialist
Test 4 2017

Section 1 Calculator Free

Trigonometry

STUDENT'S NAME _____

DATE: Thursday 29 June **TIME:** 55 minutes **MARKS**: 55

INSTRUCTIONS:

Standard Items: Pens, pencils, drawing templates, eraser, page of A4 notes

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

---

1. (3 marks)

Determine the exact value of $\cos\frac{\pi}{12}$.

2. (5 marks)

Given $\cos\alpha = -\frac{3}{4}$, α obtuse

Determine

(a) $\tan\alpha$ [2]

(b) $\sin(\alpha - 45°)$ [3]

3. (5 marks)

Determine the exact value of each of the following.

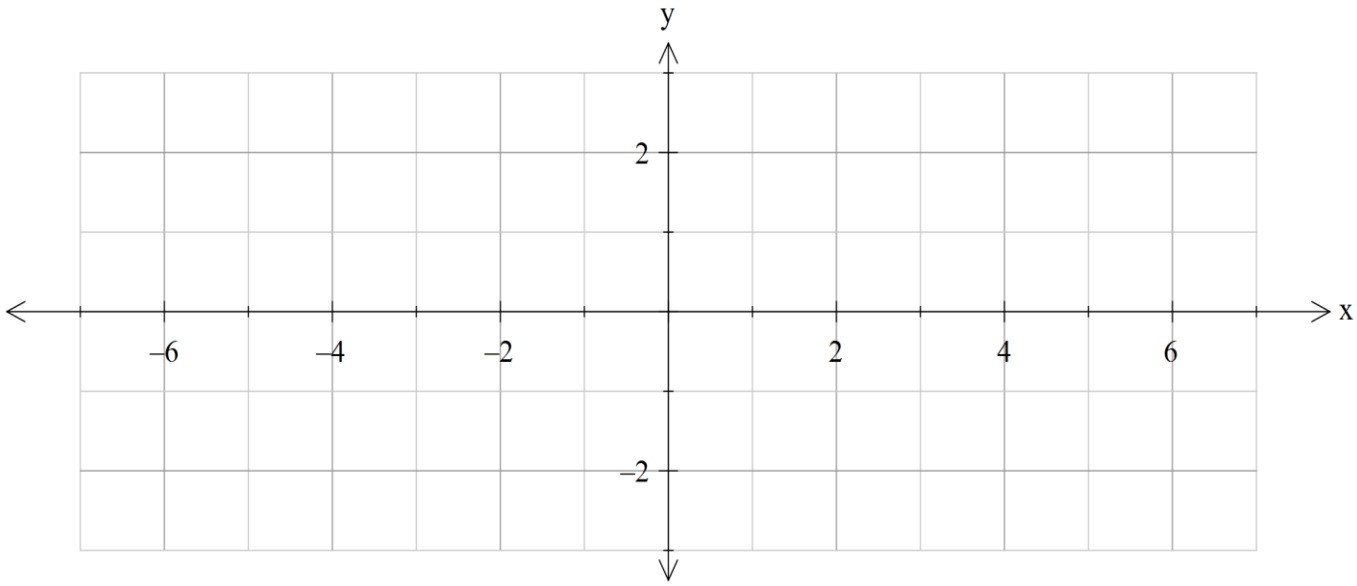
(a) $\cos 75° - \cos 15°$ [2]

(b) $\sin\frac{11\pi}{12}\sin\frac{\pi}{12}$ [3]

4. (9 marks)

(a) Express $\cos x + \sin x$ in the form $R\cos(x \pm \alpha)$, x radians. [2]

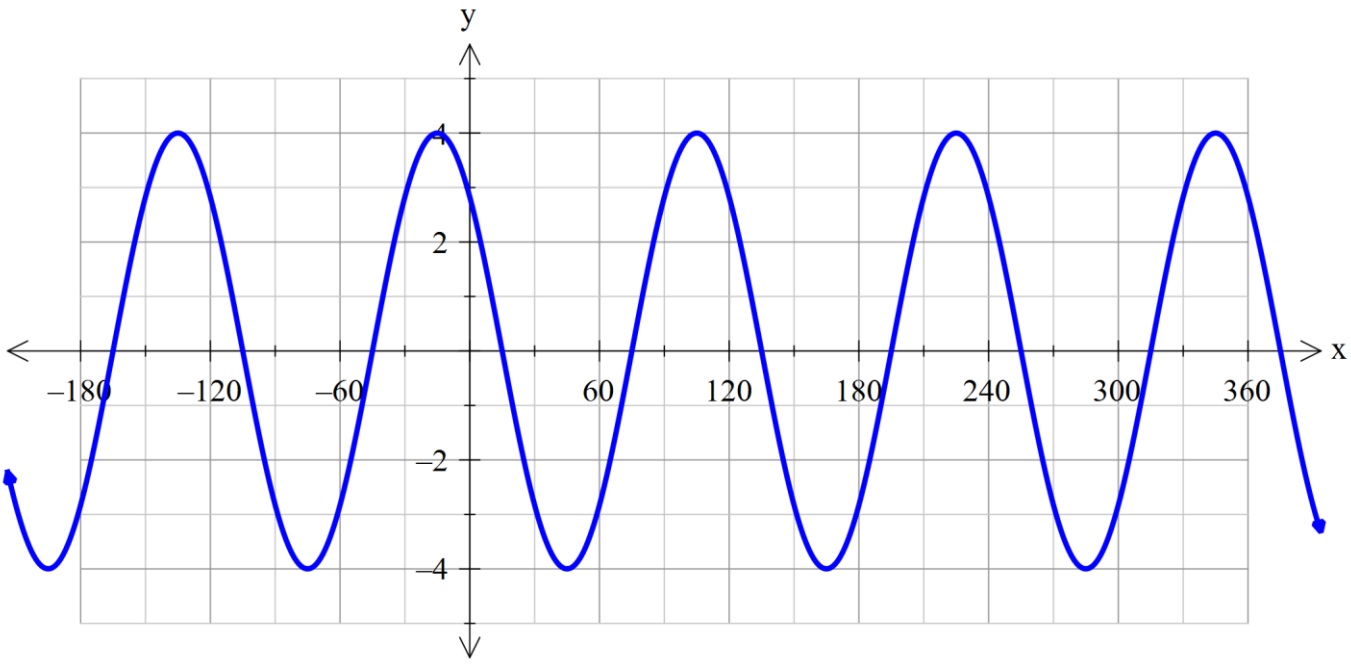
(b) Sketch $y = \cos x + \sin x$ on the axes below. [3]



(c) Solve $\cos x + \sin x = \frac{1}{\sqrt{2}}$ [4]

5. (4 marks)

Determine the equation of the function shown below, x degrees.



6. (3 marks)

Given $\sin\frac{\beta}{2}=\frac{3}{\sqrt{a}}$, show $\sin\beta=\frac{6\sqrt{a-9}}{a}$

7. (5 marks)

Determine the exact solutions for the equation $\cos(3\vartheta - \frac{\pi}{8}) = \frac{\sqrt{3}}{2}$ for $-\frac{\pi}{2} \le \vartheta \le \frac{2\pi}{3}$

8. (5 marks)

(a) Prove $3\tan 2x + 2\tan x = \frac{8\tan x - 2\tan^3 x}{1 - \tan^2 x}$ for $x \neq \frac{\pi}{4}, \frac{3\pi}{4}$ over $0 \le x \le \pi$ [3]

(b) Explain why $x \neq \frac{\pi}{4}, \frac{3\pi}{4}$ in (a). [2]

9. (10 marks)

Prove each of the following.

(a) $\frac{1}{2}\sin 2A\cos 2A = \sin A\cos^3 A - \sin^3 A\cos A$ [3]

(b) $\cot B(\cos B - \sec B) = -\sin B$ [3]

(c) $\dfrac{\cos 28° + \sin 28°}{\cos 28° - \sin 28°} = \cot 17°$ [4]

10. (5 marks)

Solve $\tan 5x = \cot 13x \quad 0 \le x \le \dfrac{\pi}{4}$