# CONTOUREDUCATION

## VCE Specialist Mathematics ½
## Advanced Trigonometric Functions [3.4]
## Test Solutions

### 20.5 Marks. 23 Minutes Writing.

### Results:

| Test Questions | _____ / 20.5 |
|---|---|

## Section A: Test Questions (20.5 Marks)

**Question 1** (3.5 marks)

Tick whether the following statements are **true** or **false**.

| Statement | True | False |
|---|---|---|
| **a.** Secant graphs have a vertical asymptote whenever sine is equal to 0. | | ✓ |
| **b.** Cotangent graphs have an $x$-intercept when the tangent is undefined. | ✓ | |
| **c.** $\text{Sec}(x)$, 1 and $\tan(x)$ form the sides of a right-angle triangle on a unit circle. | ✓ | |
| **d.** Compound angle formula for $\cos(2x - y)$ is given by $\cos(2x)\sin(y) + \sin(2x)\cos(y)$. | | ✓ |
| **e.** Double angle formula can be used to find the value of $\tan\left(\frac{\pi}{16}\right)$ without technology. | ✓ | |
| **f.** $\cos^{-1}(x)$ has a range of $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$.    False. That's the range of arcsin. | | ✓ |
| **g.** The range of $\frac{\pi}{2} - \cos^{-1}(2x - 1)$ is given by $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$. | ✓ | |

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**Question 2** (7 marks)

Consider the function $f(x) = -3 + 2 \sec\left(2x - \frac{\pi}{3}\right)$ for $x \in [0, 2\pi]$.

**a.** Find the equation(s) of any asymptotes of the function. (2 marks)

$$x = \frac{5\pi}{12}, \frac{11\pi}{12}, \frac{17\pi}{12}, \frac{23\pi}{12}$$

**b.** Sketch the graph of $f$ on the axes below, labelling all endpoints with their coordinates, and all asymptotes with their equations. (5 marks)
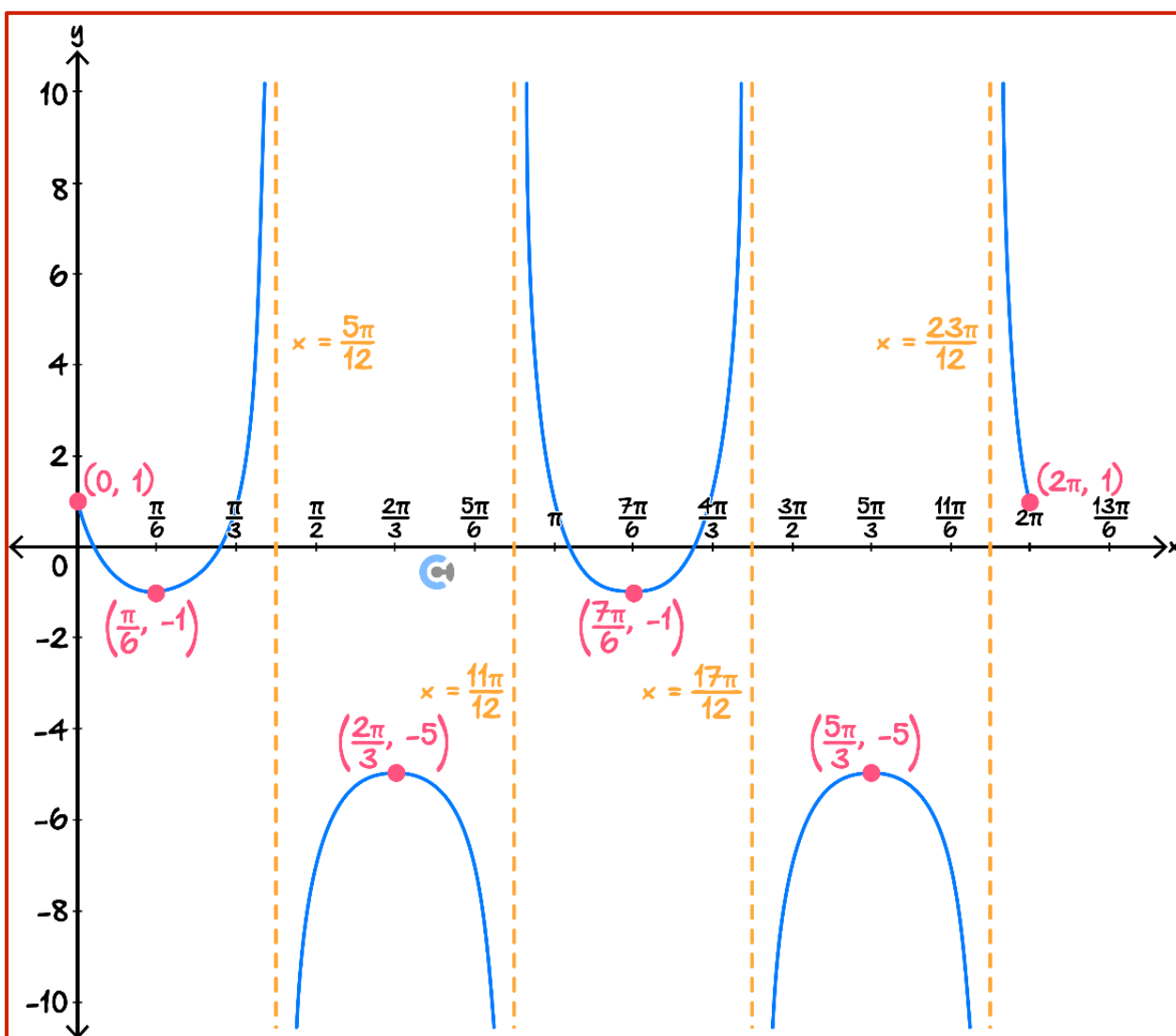
**Question 3** (3 marks)

Given that $\sin(x - y) = \frac{3}{5}$, $\cos(x) = \frac{4}{5}$ and $\cos(y) = \frac{5}{13}$, find $\sin(x + y)$.

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$$\boxed{\frac{63}{65}}$$

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**Question 4** (3 marks)

Show why $\arccos(x) + \arccos(-x) = \pi$ for all $x \in [-1, 1]$.

$$\arccos(x) + \arccos(-x) = \pi$$
$$\Rightarrow \arccos(-x) = \pi - \arccos(x)$$
$$\text{let} \quad \arccos(-x) = y$$
$$\Rightarrow \cos(y) = -x$$
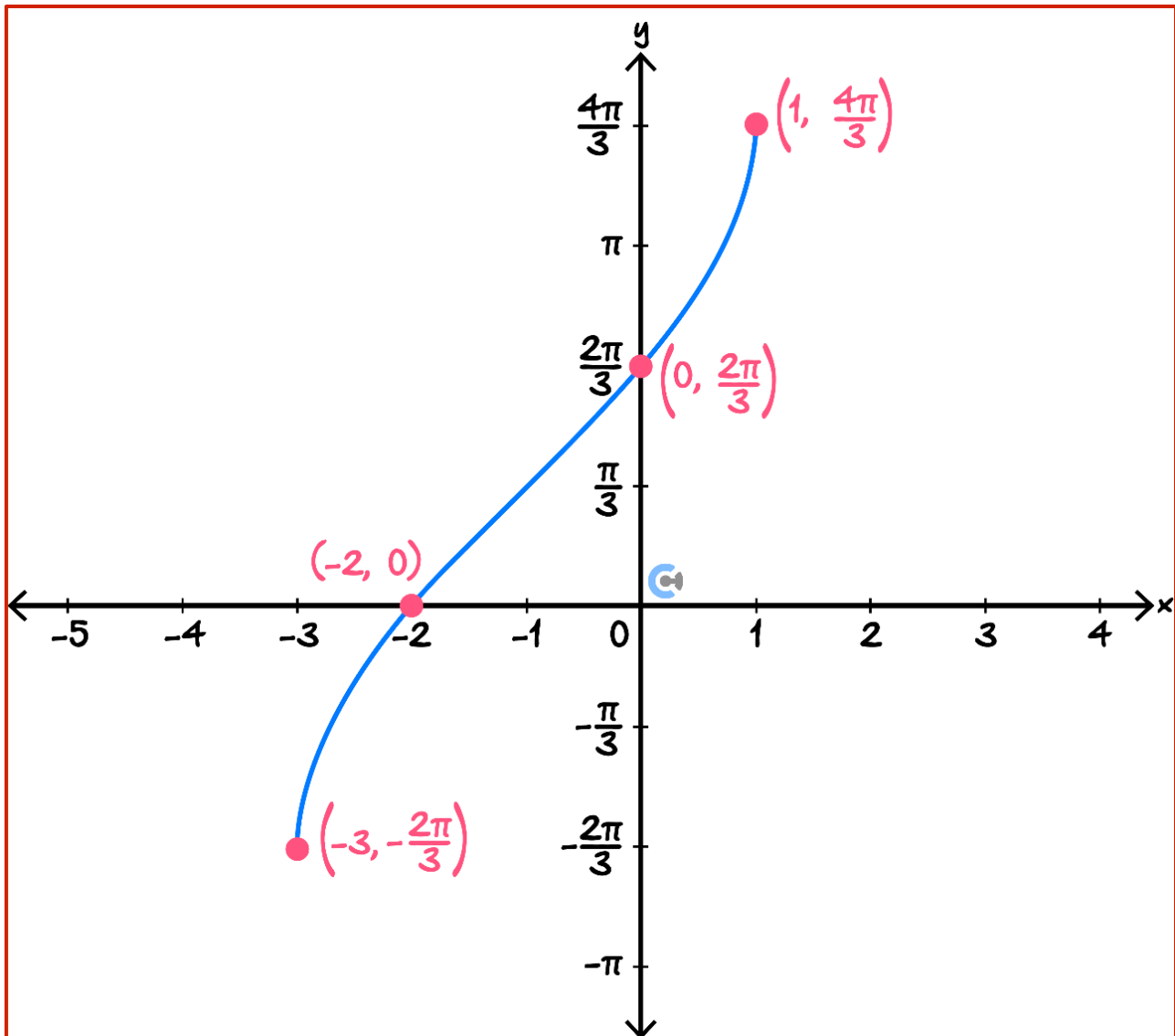$$\Rightarrow -\cos(y) = x \quad \Rightarrow \cos(\pi - y) = x$$
$$\pi - y = \arccos(x)$$
$$\Rightarrow \arccos(-x) = \pi - \arccos(x)$$

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**Question 5** (4 marks)

State the maximal domain and the range of $y = 2\arcsin\left(\frac{1}{2}(1+x)\right) + \frac{\pi}{3}$ and sketch the graph over its maximal domain, labelling endpoints with their coordinates.



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## VCE Specialist Mathematics ½

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