Worked Solutions for ENGAA Papers by Topic

Section 1

Topic: Trigonometry

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ENGAA S1 2019 - Question 27

27 It is given that

 $7\cos x + \tan x \sin x = 5$

where $0^\circ < x < 90^\circ$

What are the possible values of tan x?

A
$$\frac{1}{2}$$
 or $\frac{1}{3}$
B $\frac{1}{\sqrt{3}}$ or $\frac{1}{2\sqrt{2}}$
C $\frac{\sqrt{3}}{2}$ or $\frac{2\sqrt{2}}{3}$
D $\sqrt{3}$ or $2\sqrt{2}$
E 3 or 2
ENGAA S1 2019 - Question 27 - Worked Solution
7 + $tan^2x = 5secx$
7 + $sec^2 - 1 = 5secx$
 $\lambda^2 - 5\lambda + 6 = 0$ ($\lambda = secx$)
 $\lambda = \frac{5}{2} \pm \frac{1}{2}\sqrt{25 - 24}$
 $secx = 2, 3$
Using $tan^2x + 1 = sec^2x$
 $sec = 2$
 $tanx = \sqrt{4} - 1$
 $tanx = \sqrt{3}$
 $sec = 3$
 $tanx = \sqrt{9} - 1$
 $tanx = 2\sqrt{2}$

Answer is D

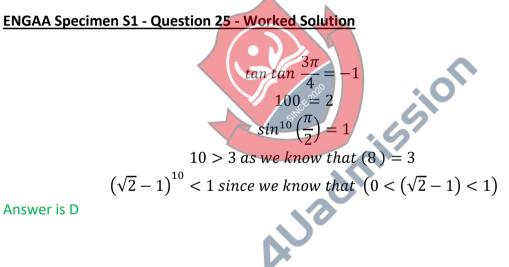
ENGAA Specimen S1 - Question 25

25 Which one of the following numbers is largest in value?

(All angles are given in radians.)

- **A** $\tan\left(\frac{3\pi}{4}\right)$ B log₁₀ 100
- $c = \sin^{10}\left(\frac{\pi}{2}\right)$
- log₂10 D

$$E (\sqrt{2} - 1)^{10}$$

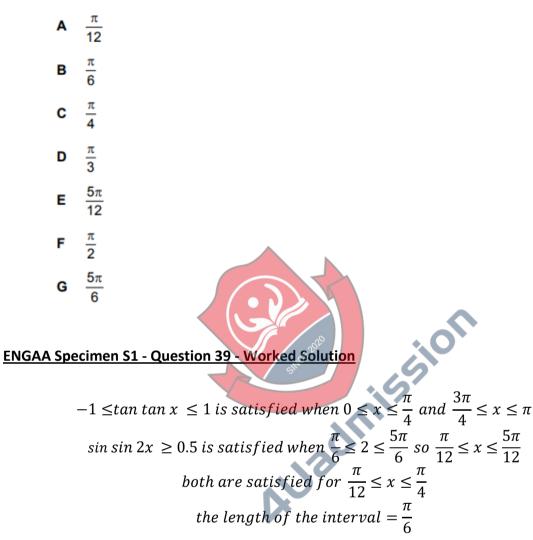


Answer is D

ENGAA Specimen S1 - Question 39

39 The angle x is measured in radians and is such that $0 \le x \le \pi$.

The total length of any intervals for which $-1 \le \tan x \le 1$ and $\sin 2x \ge 0.5$ is



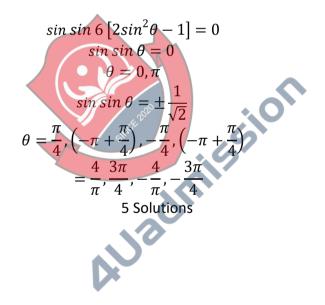
Answer is B

ENGAA S1 2018 - Question 31

31 How many solutions of the equation $2\sin^3\theta = \sin\theta$ lie in the interval $-\frac{\pi}{2} \le \theta \le \pi$?

- **A** 2
- **B** 3
- **C** 4
- **D** 5
- **E** 6
- **F** 7

ENGAA S1 2018 - Question 31 - Worked Solution



Answer is D.

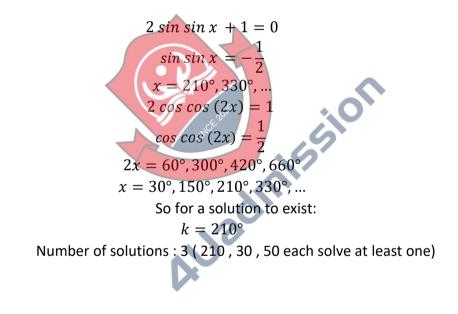
ENGAA S1 2017 - Question 31

31 *k* is the smallest positive value of *x* which is a solution to **both** the equations $2\sin x + 1 = 0$ and $2\cos 2x = 1$

How many values of x in the range $0 \le x \le k$ are solutions to at least one of these equations?

- **A** 0
- **B** 2
- **C** 3
- **D** 4
- **E** 8

ENGAA S1 2017 - Question 31 - Worked Solution



Answer is C

ENGAA S1 2016 - Question 37

37 Given that $7\cos\theta - 3\tan\theta\sin\theta = 1$, which one of the following is true?

A
$$\cos \theta = -\frac{3}{5} \text{ or } -\frac{1}{2}$$

B $\cos \theta = -\frac{3}{5} \text{ or } \frac{1}{2}$
C $\cos \theta = \frac{3}{5} \text{ or } \frac{1}{2}$
D $\cos \theta = \frac{3}{5} \text{ or } -\frac{1}{2}$

ENGAA S1 2016 - Question 37 - Worked Solution

$$7 \cos \cos \theta - 3 \tan \tan \theta \sin \sin \theta = 1$$

$$7 \cos \cos \theta - 3 \frac{\sin \sin \theta}{\cos \cos \theta} \sin \sin \theta = 1$$

$$7 \cos^2 \theta - 3 \sin^2 \theta = \cos \cos \theta$$

$$7 \cos^2 \theta - 3(1 - \cos^2 \theta) = \cos \cos \theta$$

$$Let u = \cos \cos \theta$$

$$7 u^2 - 3 + 3u^2 = u$$

$$10u^2 - u - 3 = 0$$

$$u = \frac{1 \pm \sqrt{1^2 - 4(10)(-3)}}{20}$$

$$u = \frac{1 \pm \sqrt{121}}{20}$$

$$u = \frac{1 \pm 11}{20}$$

$$u = \frac{12}{20} , \quad u = \frac{10}{20}$$

$$\cos \cos \theta = \frac{3}{5} , \quad \cos \cos \theta = -\frac{1}{2}$$

Answer is D