1.1. \(\sqrt{2x - 3} = x - 2\)

1.1.1. Non real when
\[2x - 3 \leq 0\]
\[2x \leq 3\]
\[x \leq \frac{3}{2}\]

1.1.2. Undefined when
\[x - 2 = 0\]
\[x = 2\]

1.2. \(2x - 3\) must be a perfect square
\[x = 6\]
\[2(6) - 3 = 9\]

2.1. \(100x = 356, 5656, \ldots\)
\[x = \frac{356}{100}\]
\[99x = 353\]
\[x = \frac{353}{99}\]

2.2. \(\frac{5^3}{3/157} = \frac{6^3}{3}\)
\[\frac{125}{3/157} = \frac{216}{3}\]

2.3. Ans only 0/3

2.4. \(5\) and \(6\)
\[5^3 = 125, 6^3 = 216\]

Ans only 0/2
2.1. \(3x^2 \left(4x - \frac{3}{4} + 2x \right)^2\)

\[
= 12x^0 + 6x^2
\]

\[
= 12 + 6x^2
\]

(2)

2.2. \(4(x^2 - 5y)^2 - (4x - y)(x + y) + (2x + y)(2x - y)\)

\[
= 4(x^2 - 5y)^2 - (4x - y)(x + y) + (2x + y)(2x - y)
\]

\[
= 4(x^2 - 5y)^2 - (4x^2 + 3xy - y^2) + (4x^2 - y^2)
\]

\[
= 36x^2 - 120xy + 100y^2 - 4x^2 - 3xy + y^2 + 4x^2 - y^2
\]

\[
= 36x^2 - 123xy + 100y^2
\]

(4)

4.1. \(2pq^2 + 2pq - 8p^3q^3\)

\[
= 2pq \left(pq + 1 - 4p^2q^2\right)
\]

\[
= 2pq \left(-4p^2q^2 + pq + 1\right)
\]

\[
= 2pq \left[-(4p^2q^2 - pq - 1)\right]
\]

\[
= -2pq \left(4p^2q^2 - pq - 1\right)
\]

(1)

4.2. \(3x^2 - 15x - 18\)

\[
= 3(x^2 - 5x - 6)
\]

\[
= 3(x - 6)(x + 1)
\]

(2)

4.3. \(8a^3 - 1\)

\[
= (2a - 1)(4a^2 + 2a + 1)
\]

(2)

4.4. \((x^2 + 1)^2 - 7(x^2 + 1) + 10\)

\[
= x^2 + 1
\]

\[
= x^2 - 7k + 10
\]

\[
= (k - 5)(k - 2)
\]

\[
= (x^2 + 1 - 5)(x^2 + 1 - 2)
\]

\[
= (x^2 - 4)(x^2 - 1)
\]

\[
= (x - 2)(x + 2)(x - 1)(x + 1)
\]

(3)
5.1. \[ \frac{2}{3x} - \frac{3}{2x} + 1 \]
\[ = \frac{2 \cdot 2 - 3 \cdot 3 + 1 \cdot 6x}{6x} \]
\[ = \frac{4 - 9 + 6x}{6x} \]
\[ = \frac{6x - 5}{6x} \]
\[ = \frac{6x - 5}{6x} \]
\[ = 1 - \frac{5}{6x} \]

6.1. \[ \frac{2 + n}{2} \cdot \frac{3n - 2}{2n + 1} \]
\[ = \frac{2}{2n + 1} \]
\[ = \frac{4n - 2}{2n + 1} \]
\[ = 2 \]
\[ = \frac{2}{2n + 1} \]
\[ = \frac{2}{2n - 1} \]
\[ = \frac{1}{2} \]
\[ = \frac{1}{4} \]

5.2. \[ \frac{x^2 - 4}{x} \times \frac{x}{2x^2 + 18} \times \frac{4x - 2x^2}{x} \]
\[ = \frac{(x-2)(x+2)}{x} \times \frac{x}{2(x^2 + 18)} \times \frac{1}{2x(x-2)} \]
\[ = \frac{x+2}{4(x^2 + 4)} \]

6.2. \[ \frac{12^{n+1} \cdot 9^{2n-1}}{36^n \cdot 8^{1-n}} \]
\[ = (\frac{2 \cdot 3}{(2 \cdot 3)^n}) \times (\frac{3^2}{2^3})^{2n-1} \]
\[ = \frac{2^{2n+2} \cdot 3^{n+1} \cdot 3^{4n-2}}{2^{2n} \cdot 3^{2n} \cdot 2^{2-3n}} \]
\[ = \frac{2^{2n+2} \cdot 3^{n+1}}{2^{2n} \cdot 3^{2n} \cdot 2^{2-3n}} \]
\[ = \frac{2}{2^n + 3 \cdot 3^{n-1}} \]
\[ = \frac{2^{n+2} \cdot 3^{n-1}}{2^n \cdot 3^n} \]
\[ = \frac{3^n - 1}{3^n} \]
6.3.
\[
\frac{5 \cdot 2^x - 4 \cdot 2^{x-2}}{2^x - 2^{x-1}}
\]
\[
= \frac{5 \cdot 2^x - 4 \cdot 2^x \cdot 2^{-2}}{2^x - 2^x \cdot 2^{-1}}
\]
\[
= \frac{2^x \left( 5 - 4 \cdot 2^{-2} \right)}{2^x \cdot (1 - 2^{-1})}
\]
\[
= \frac{5 - 4 \cdot \frac{1}{4}}{1 - \frac{1}{2}}
\]
\[
= \frac{\frac{5}{2} - \frac{1}{2}}{1 - \frac{1}{2}}
\]
\[
= \frac{4 \times \frac{2}{1}}{1 - \frac{1}{2}}
\]
\[
= 8
\]

7.1.1.
\[
2^x = \frac{1}{32}
\]
\[
= 2^{-5}
\]
\[
\therefore \quad x = -5
\]
- Use logs
- Ans only 0/2

7.1.2.
\[
3^x - 7 \cdot 3^x - 18 = 0
\]
\[
k = 3^x
\]
\[
k^2 - 7k - 18 = 0
\]
\[
(k + 2)(k - 9) = 0
\]
\[
\therefore \quad k = -2 \quad \text{or} \quad k = 9
\]
\[
3^x = -2 \quad \text{(no solution)}
\]
\[
\therefore \quad x = 2
\]

7.1.3.
\[
\frac{3x}{x-2} - \frac{x+1}{x+2} = \frac{2}{x^2 - 4}
\]
\[
\frac{3x}{x-2} - \frac{x+1}{x+2} = \frac{2}{(x-2)(x+2)}
\]
\[
\therefore \quad (x-2)(x+2)
\]
\[
\text{LHS} = \frac{x+1}{x-2}
\]
\[
\therefore \quad x \neq \pm 2
\]
\[
3x(x+2) - (x+1)(x-2) = 2
\]
\[
3x^2 + 6x - (x^2 - x - 2) = 2
\]
\[
3x^2 + 6x - x^2 - x - 2 - 2 = 0
\]
\[
2x^2 + 7x = 0
\]
7.1.4. \( ab^2 = 2abx - ax \)  
\( \frac{b^2}{2b-1} = x \)  
\( \frac{b^2}{2b-1} = \frac{1}{2} \)

7.1.5. \( 5x + 7 \geq 29 - 6x \)  
\( 11x \geq 22 \)  
\( x \geq 2 \)

7.1.6. \( -4 \leq \frac{2 - 3x}{2} \leq 8 \)  
\( x^2: -8 \leq 2 - 3x \leq 16 \)  
\( -2: -10 \leq -3x \leq 14 \)  
\( -\frac{10}{3} \geq x \geq -\frac{14}{3} \)

7.1.7. \( x - \frac{2}{3} = 10 \)  
\( (x - \frac{2}{3})^{-\frac{1}{2}} = \pm (10)^{-\frac{3}{2}} \)  
\( x = \pm 0.03 \)

7.1.8. \( 6x^{5/2} - 5x^{5/4} - 6 = 0 \)  
\( k = \frac{5}{2} \)  
\( 4k^2 - 5k - 6 = 0 \)  
\( (2k - 3)(3k + 2) = 0 \)  
\( k = \frac{3}{2}, x = -\frac{2}{3} \)

7.2. \( a + 3b = 5 \)  
\( a + 3b = 5 \)  
\( 2a - b = 2 \)  
\( a - 3b = 6 \)

\( 7a = 11 \)  
\( a = \frac{11}{7} \)

\( 2(\frac{11}{7}) - b = 2 \)  
\( \frac{22}{7} = b \)

\( a + 3b = 5 \)  
\( a = 5 - 3b \)  
\( a - b = 2 \)

\( 2(5 - 3b) - b = 2 \)  
\( 10 - 6b - b = 2 \)  
\( 8 = 7b \)  
\( \frac{8}{7} = b \)

\( \therefore a = 5 - 3(\frac{8}{7}) \)  
\( = \frac{11}{7} \)
8. \[ 23; 19; 15; \ldots \]

8.1. \[ 11; 7 \]

8.2. \[ a = 23 \quad d = -4 \]

\[ T_n = a + (n-1)d \]
\[ = 23 + (n-1)(-4) \]
\[ = 23 + (-4n + 4) \]
\[ = 23 - 4n + 4 \]
\[ = -4n + 27 \]

8.3. \[ T_n = -4n + 27 \]
\[ T_{250} = -4(250) + 27 \]
\[ = -973 \]

8.4. \[ T_n = -4n + 27 \]
\[ -100 = -4n + 27 \]
\[ 4n = 127 \]
\[ n = \frac{127}{4} \]

No, -100 is not a term in the pattern as \( n \in \mathbb{N} \)

\[ \text{ans only } \frac{1}{3} \]
10. $\sin A = \frac{BC}{AC}$

$\sin A = \frac{BD}{AB}$

11.1 $\hat{A} = 62.8^\circ$ $\hat{B} = 47.3^\circ$

11.1.1 $\sin \frac{A}{3} = \sin \frac{62.8^\circ}{3} = 0.36$

11.1.2 $\tan B = \frac{\tan 47.3^\circ}{2} = 0.54$

11.1.3 $\cos A = 3$

$= \cos 62.8^\circ - 3$

$= -2.54$

11.1.4 $3 \sin^2 B$

$= 3 \sin^2 47.3^\circ$

$= 3 \cdot (\sin 47.3^\circ)^2$

$= 1.62$

11.2.1 $\sin \theta = 0.683$

$\theta = \sin^{-1}(0.683)$

$= 43.08^\circ$

11.2.2 $\arccos(\cos(3\theta - 47^\circ)) = 2.68$

$A = 3\theta - 47^\circ$

4. $\cos A = 2.88$

$\cos A = \frac{18}{20}$ $= 0.72$
\[ A = \cos^{-1} \left( \frac{18}{25} \right) \]

30.47° = 43.94°

38° = 90.94°

θ = 30.32°

\[ \tan \theta = \frac{7}{\sin 35°} \]

\[ = 12.204... \]

\[ \therefore \tan \theta = 1.84... \]

\[ \theta = \tan^{-1} (1.84...) \]

\[ = 61.49° \]

\[ \tan \angle 2 = \frac{5}{6} \]

\[ \angle 2 = \tan^{-1} \left( \frac{5}{6} \right) \]

\[ = 39.81° \]

\[ \tan 54.81° = \frac{BD}{6} \]

\[ 6 \times \tan 54.81° = BD \]

\[ 8.50... = BD \]

\[ \therefore BC = 8.50... - 5 \]

\[ = 3.51 \]