1. Divide \( \frac{6x^3-13x^2+18x-1}{3x-2} \) Using long division, we should get \( 2x^3 - 3x + 4 + \frac{7}{3x-2} \)
Answer : D

2. What is the length of \( OC \triangle ABC \) is a right triangle thus \( 10^2 + 24^2 = (AB)^2 \).
Solving for \( AB \), we get \( AB = 26 \). Since \( AB \) is the diameter and \( OC \) is the
radius, thus \( OC = \frac{1}{2}AB = \frac{1}{2} * 26 = 13 \). Thus \( OC = 13 \) Answer: B

3. one solution to \( z^2 + 81 = 0 \) is
\[
\begin{align*}
z^2 + 81 &= 0 \\
z^2 &= -81 \\
\sqrt{z^2} &= \sqrt{-81}
\end{align*}
\]
Since there is a negative under the radical, we get imaginary roots. Thus
\[
z = -9i
\]
or
\[
z = +9i
\]
Answer: E

4. Simplifying:
\[
\sqrt{9a^8y^{12} - 9y^{12}} = \sqrt{9y^{12}(x^8 - 1)} = 3y^6\sqrt{x^8 - 1}
\]
Answer: B

5. Simplifying:
\[
\left(16a^{\frac{1}{2}}b^{-8}c^{\frac{1}{2}}\right)^{\frac{1}{4}} = 16^{\frac{1}{4}}a^{\frac{1}{4}}b^{-2}c^{\frac{1}{4}}
\]
\[
= 2a^4b^{-2}c^3
\]
\[
= \frac{2a^4c^3}{b^2}
\]
Answer: C

6. Solving for \( x \):
\[
-5 + \sqrt{x - 8} = 2
\]
\[
\sqrt{x - 8} = 2 + 5
\]
\[
\sqrt{x - 8} = 7
\]
\[
(\sqrt{x - 8})^2 = 7^2
\]
\[
x - 8 = 49
\]
\[
x = 49 + 8
\]
\[
x = 57
\]
Answer: C
7. Simplifying:

\[
\frac{x^2 + 11x - 26}{x - 12} \cdot \frac{x^2 - 12x}{x^2 + x - 6} = \frac{(x + 13)(x - 2)}{x - 12} \cdot \frac{x(x - 12)}{(x - 2)(x + 3)}
\]

\[
= \frac{x(x + 13)}{x + 3}
\]

Answer: E

8. Simplifying:

\[
\frac{1}{x - 7} + \frac{9}{(x - 7)^2} = \frac{x - 7}{(x - 7)^2} + \frac{9}{(x - 7)^2}
\]

\[
= \frac{x - 7 + 9}{(x - 7)^2}
\]

\[
= \frac{x + 2}{(x - 7)^2(x + 1)}
\]

Answer: D

9. by the Pythagorean Theorem:

\[
5^2 + x^2 = (AB)^2
\]

\[
25 + x^2 = (AB)^2
\]

\[
10^2 + x^2 = (BC)^2
\]

\[
100 + x^2 = (BC)^2
\]

\[
(AB)^2 + (BC)^2 = (AC)^2
\]

\[
(25 + x^2) + (100 + x^2) = (5 + 10)^2
\]

\[
125 + 2x^2 = 225
\]

\[
2x^2 = 225 - 125
\]

\[
2x^2 = 100
\]

\[
x^2 = \frac{100}{2}
\]

\[
x^2 = 50
\]

\[
x = \sqrt{50}
\]

Answer: E

10. A number is not a root of \(x^4 - 10x^3 + 5x^2 + 100x + 84\) if it does not make the polynomial equal to 0. So, check each answer until one of them does not make
the polynomial 0.

In this case the answer is 1.

\[ f(1) = 1^4 - 10(1)^3 + 5(1)^2 + 100(1) + 84 = 180 \neq 0 \]

Answer: D

11. Answer: E.

12. Using the distance formula where \((x_1, y_1) = (-3, -8)\) and \((x_2, y_2) = (-6, -3)\):

\[
d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}
\]

\[
= \sqrt{(-6 - (-3))^2 + (-3 - (-8))^2}
\]

\[
= \sqrt{3^2 + 5^2}
\]

\[
= \sqrt{34}
\]

Answer: C

13. Using the fact that the angles of a triangle sum to 180°:

\[
70° + 60° + c° = 180°
\]

\[
130° + c° = 180°
\]

\[
c° = 180° - 130°
\]

\[
c° = 50°
\]

We have solved for \(c°\) so we need to solve for \(c\).

\[
c° + c = 180°
\]

\[
50° + c = 180°
\]

\[
c = 180° - 50°
\]

\[
c = 130°
\]

Answer: D

14. Solving for \(x\):

\[
7^x7^{x+14} = 7^{3x-4}
\]

\[
7^{x+x+14} = 7^{3x-4}
\]

\[
7^{2x+14} = 7^{3x-4}
\]

\[
7^{2x+14} = 7^{3x-4}
\]

\[
2x + 14 = 3x - 4
\]

\[
14 + 4 = 3x - 2x
\]

\[
18 = x
\]
15. Simplifying:

\[
\frac{x^3y^{-2}}{(3x-1y^2)^4} = \frac{x^3y^{-2}}{3^4x^{-4}y^8}
\]

\[
= \frac{x^3x^4}{81y^8y^2}
\]

\[
= \frac{x^7}{81y^{10}}
\]

Answer: D

16. Using rules of Logarithms: \( \log_8 c = b \Rightarrow 8^b = c. \)

Answer: B

17. \((2, 3) \rightarrow (2, -3) \rightarrow (2, 5) \rightarrow (5, 2)\)

Answer: C

18. Area of a trapezoid = \( \frac{a+b}{2} h. \)

\( a = 3, b = 5 \) solve for \( h. \)

\[
\frac{3 + 5}{2} h = 28
\]

\[
\frac{8}{2} h = 28
\]

\[
4h = 28
\]

\[
h = 7
\]

Answer: B

19. One side has length 17 and the other side has length 25. To get the third length we need

\[
c^2 = a^2b^2 - 2 \cdot a \cdot b \cdot \cos(\theta)
\]

The answer is A

20. Simplify \( \frac{(8x)^{\frac{1}{2}}}{(64x)^{\frac{1}{2}}} \)

\[
= \frac{\sqrt{2^3x}}{\sqrt{8^2x}} = \frac{2x^{\frac{3}{2}}}{8x^{\frac{3}{2}}}
\]

\[
= x^{-\frac{1}{2}} = \frac{1}{4\sqrt{x}}
\]

Answer: D
21.
\[ x^2 + 27 \leq -12x \]
\[ x^2 + 12x + 27 \leq 0 \]
\[ (x + 3)(x + 9) \leq 0 \]

Test an x value between -9 and -3, say -5

\[ (-5 + 3)(-5 + 9) = (-2)(4) \leq 0 \]

Therefore

\[ -9 \leq x \leq -3 \]

Answer: A

22. Solve for x

\[ \log_{15}(x + 1) = 3 \log_{15} 4 \]
\[ \log_{15}(x + 1) = \log_{15} 4^3 \]
\[ \log_{15}(x + 1) = \log_{15} 64 \]

Since both have the same base, thus

\[ 15^{\log_{15}(x+1)} = 15^{\log_{15} 4^3} \]
\[ x + 1 = 64 \]
\[ x = 63 \]

Answer: B

23. Solve by completing the square

\[ x^2 + 8x + 2 = \]

For completing the square, we need \( \left(\frac{b}{2}\right)^2 \). Here \( b = 8 \). Thus

\[ x^2 + 8x + 16 - 16 + 2 = x^2 + 8x + 16 - 14 = (x + 4)^2 - 14 \]

Answer : E

24. Find one root

\[ -7x^2 - 6x + 10 \]

Using the quadratic equation.

\[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]
\[ x = \frac{6^2 \pm \sqrt{6^2 - 4(-7)(10)}}{2(-7)} \]
\[ x = \frac{6 \pm \sqrt{36 + 280}}{-14} \]
\[ x = \frac{6 \pm \sqrt{316}}{-14} \]

Answer: D
25. \( S = r\theta \), where \( S \) is the distance between Katrina and Jensine.
\[ r = 100 \text{ and } \theta = \frac{\pi}{4}. \]
So, \( S = r\theta = 100\left(\frac{\pi}{4}\right) = 25\pi \)
Answer: B

26. All the angles of a triangle add up to 180 degrees, so
\[
55 + 55 + 9x = 180 \\
110 + 9x = 180 \\
9x = 70 \\
x = \frac{70}{9}
\]
Answer: A

27. Solve for \( x \)
\[
\log_2 x + \log_2(x - 4) = 15 \\
\log_2 (x(x - 14)) = 5 \\
(x(x - 14)) = 2^5 \\
x^2 + 4x = 32 \\
x^2 + 4x - 32 = 0
\]
Factoring,
\[
(x + 2)(x - 16) = 0 \\
x = -2, 16
\]
Since we cannot log a negative number, thus \( x = 16 \) Answer: D

28. The inequality is equivalent to:
\[
x^2 + 10x > -24 \\
x^2 + 10x + 24 > 0
\]
Factoring,
\[
(x + 6)(x + 4) > 0 \\
x = -6
\]
or
\[
x = -4
\]
Testing points, we get
\[
x < -6
\]
or
\[
x > -4
\]
Answer: C
29. The radius of a circle is increased by a factor of 4. If the original area is 20, what is the new area? Increasing the radius by a factor of 4 increases area by factor of $4^2$. Thus

$$A = 20 \times 4^2 = 20 \times 16 = 320$$

Answer: A

30. Solve for $x$

$$5^x \times 5^{x+13} = 125^{x-\frac{3}{3}}$$
$$5^{2x+13} = 5^{3(x-\frac{3}{3})}$$
$$5^{2x+13} = 5^{3x-5}$$

Since they have the same base, thus:

$$2x + 13 = 3x - 5$$
$$x = 18$$

Answer: B

31. This problem can be modeled by a right triangle with a leg of 4, a leg of $x$, and a hypotenuse of $(x + 1)$

$$x^2 + 4^2 = (x + 1)^2$$
$$x^2 + 16 = x^2 + 2x + 1$$
$$2x = 15$$
$$x = \frac{15}{2}$$

Answer: A

32. Simplify

$$\frac{x}{x + 3y} + \frac{11y}{x - 3y}$$

Multiply by the LCD, which is $(x + 3y)(x - 3y) = x^2 - 9y^2$

$$\frac{x(x - 3y) + 11y(x - 3y)}{x^2 - 9y^2}$$
$$\frac{x^2 - 3xy + 11xy - 33y^2}{x^2 - 9y^2}$$
$$\frac{x^2 + 8xy - 33y^2}{x^2 - 9y^2}$$

Answer: A
33. 

\[
\log_5(x - 4) - \log_5 x = \log_5 13 \\
\log_5(\frac{x - 4}{x}) = \log_5 13
\]

Since both have the same base, thus

\[
5^{\log_5(\frac{x - 4}{x})} = 5^{\log_5 13}
\]

\[
\frac{x - 4}{x} = 13
\]

\[
x - 4 = 13x
\]

\[
x = -\frac{4}{12} = -\frac{1}{3}
\]

Since we cannot log a negative number, thus there is no solution. Answer: E

34. A circle has area 64\(\pi\). What is the circumference of the circle?

\[
A = \pi * r^2 = 64\pi
\]

Solving for \(r\)

\[
r^2 = 64
\]

Implies \(r = 8\) For circumference: \(c = 2\pi * r\)

\[
c = 2 * \pi * 8 = 16\pi
\]

Answer: E

35. If \(f(x) = 9x^2 - x + 2\), then \(f(c - 10) =?\)

\[
9(c - 10)^2 - (c - 10) + 2
\]

\[
= 9(c^2 - 20c + 100) - c + 10 + 2
\]

\[
= 9c^2 - 180c + 900 - c + 2
\]

\[
= 9c^2 - 181c + 912
\]

Answer: A

36. What is the length of \(DE\)? Using similar triangles,

\[
\frac{AC}{DE} = \frac{BC}{BE}
\]

Since \(AC = 15, BE = 6, EC = 2, BC = 8\) Thus

\[
\frac{15}{DE} = \frac{8}{6}
\]

Solving

\[
DE = \frac{90}{8} = \frac{45}{4}
\]

Answer: B