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

$$\begin{aligned} z^2 + 81 &= 0 \\ z^2 &= -81 \\ \sqrt{z^2} &= \sqrt{-81} \end{aligned}$$

Since there is a negative under the radical, we get imaginary roots. Thus

$$z = -9i$$

or

$$z = +9i$$

Answer: E

4. Simplifying:

$$\begin{aligned} \sqrt{9x^8y^{12} - 9y^{12}} &= \sqrt{9y^{12}\left(x^8 - 1\right)} \\ &= \sqrt{9y^{12}}\sqrt{(x^8 - 1)} \\ &= 3y^6\sqrt{x^8 - 1} \end{aligned}$$

Answer: B

5. Simplifying:

$$\begin{aligned} \left(16a^{\frac{1}{4}}b^{-8}c^{12}\right)^{\frac{1}{4}} &= 16^{\frac{1}{4}}a^{16\frac{1}{4}}b^{-8\frac{1}{4}}c^{12\frac{1}{4}} \\ &= 2a^4b^{-2}c^3 \\ &= \frac{2a^4c^3}{b^2} \end{aligned}$$

Answer: C

6. Solving for x:

$$\begin{aligned} -5 + \sqrt{x-8} &= 2 \\ \sqrt{x-8} &= 2 + 5 \\ \sqrt{x-8} &= 7 \\ \left(\sqrt{x-8}\right)^2 &= 7^2 \\ x - 8 &= 49 \\ x &= 49 + 8 \\ x &= 57 \end{aligned}$$

Answer: C

7. Simplifying:

$$\begin{aligned}\left(\frac{x^2+11x-26}{x-12}\right)\left(\frac{x^2-12x}{x^2+x-6}\right) &= \left(\frac{(x+13)\,(x-2)}{x-12}\right)\left(\frac{x(x-12)}{(x-2)(x+3)}\right)\\ &= \left(\frac{(x+13)\,\cancel{(x-2)}}{\cancel{x-12}}\right)\left(\frac{x\cancel{(x-12)}}{\cancel{(x-2)}(x+3)}\right)\\ &= \frac{x(x+13)}{x+3}\end{aligned}$$

Answer: E

8. Simplifying:

$$\begin{aligned}\frac{\frac{1}{x-7}+\frac{9}{(x-7)^2}}{x+1} &= \frac{\frac{x-7}{(x-7)^2}+\frac{9}{(x-7)^2}}{x+1}\\ &= \frac{\frac{x-7+9}{(x-7)^2}}{x+1}\\ &= \frac{\frac{x-2}{(x-7)^2}}{x+1}\\ &= \frac{x+2}{(x-7)^2(x+1)}\end{aligned}$$

Answer: D

9. by the Pythagorean Theorem:

$$\begin{aligned}5^2+x^2 &= (\overline{AB})^2 & \qquad 10^2+x^2 &= (\overline{BC})^2\\ 25+x^2 &= (\overline{AB})^2 & \qquad 100+x^2 &= (\overline{BC})^2\end{aligned}$$

$$\begin{aligned}(\overline{AB})^2+(\overline{BC})^2 &= (\overline{AC})^2\\ (25+x^2)+(100+x^2) &= (5+10)^2\\ 125+2x^2 &= 225\\ 2x^2 &= 225-125\\ 2x^2 &= 100\\ x^2 &= \frac{100}{2}\\ x^2 &= 50\\ x &= \sqrt{50}\end{aligned}$$

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 $(x_2, y_2) = (-6, -3)$:

$$\begin{aligned} d &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(-6 - (-3))^2 + (-3 - (-8))^2)} \\ &= \sqrt{(-3)^2 + (5)^2} \\ &= \sqrt{9 + 25} \\ &= \sqrt{34} \end{aligned}$$

Answer: C

13. Using the fact that the angle's of a triangle sum to 180°:

$$\begin{aligned} 70^\circ + 60^\circ + c^\circ &= 180^\circ \\ 130^\circ + c^\circ &= 180^\circ \\ c^\circ &= 180^\circ - 130^\circ \\ c^\circ &= 50^\circ \end{aligned}$$

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

$$\begin{aligned} c^\circ + c &= 180^\circ \\ 50^\circ + c &= 180^\circ \\ c &= 180^\circ - 50^\circ \\ c &= 130^\circ \end{aligned}$$

Answer: D

14. Solving for x:

$$\begin{aligned} 7^x 7^{x+14} &= 7^{3x-4} \\ 7^{x+x+14} &= 7^{3x-4} \\ 7^{2x+14} &= 7^{3x-4} \\ \cancel{7}^{2x+14} &= \cancel{7}^{3x-4} \\ 2x + 14 &= 3x - 4 \\ 14 + 4 &= 3x - 2x \\ 18 &= x \end{aligned}$$

Answer: C

15. Simplifying:

$$\begin{aligned}\frac{x^3y^-2}{(3x^-1y^2)^4} &= \frac{x^3y^-2}{3^4x^{-4}y^8}\\ &= \frac{x^3x^4}{81y^8y^2}\\ &= \frac{x^7}{81y^{10}}\end{aligned}$$

Answer: D

16. Using rules of Logarithms: $log_8 c = b \Rightarrow 8^b = c$.
Answer: B

17. $(2,3) \to (2,-3) \to (2,5) \to (5,2)$
Answer: C

18. Area of a trapezoid $= \frac{a+b}{2}h$.
$a = 3, b = 5$ solve for h.

$$\begin{aligned}\frac{3+5}{2}h &= 28\\ \frac{8}{2}h &= 28\\ 4h &= 28\\ h &= 7\end{aligned}$$

Answer: B

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

$$c^2 = a^2b^2 - 2 * a * b * cos(\aleph)$$

The answer is A

20. Simplify $\frac{(8x)^{\frac{1}{3}}}{(64x)^{\frac{1}{2}}}$

$$\begin{aligned}&= \frac{\sqrt[3]{2^3x}}{\sqrt{8^2x}} = \frac{2x^{\frac{1}{3}}}{8x^{\frac{1}{2}}}\\ &= \frac{x^{-\frac{1}{6}}}{4} = \frac{1}{4\sqrt[6]{x}}\end{aligned}$$

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 $(\frac{b}{2})^2$. 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 distant between Katrina and Jensine.
$r = 100$ and $\theta = \frac{\pi}{4}$.
So, $S = r\theta = 100(\frac{\pi}{4}) = 25\pi$
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

$$A = 20 * 4^2 = 20 * 16 = 320$$

Answer: A

30. Solve for x

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

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

$$5^{\log_5(\frac{x-4}{x})} = 5^{\log_5 13}$$
$$\frac{x-4}{x} = 13$$
$$x - 4 = 13x$$
$$x = -4/12 = -1/3$$

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

34. A circle has area 64π. 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