1) The reduced form, with no negative or fractional exponents, of $\left[\dfrac{4a^{-3}}{3b^{-\frac{1}{2}}}\right]^{-1}$ is

a) $-\sqrt{\dfrac{4a^3}{b}}$

b) $\dfrac{-8a^3}{3b}$

c) $\dfrac{4a^3}{3\sqrt{b}}$

d) $\dfrac{3a^3}{4\sqrt{b}}$

e) $\dfrac{3a^3}{2b}$

2) Which is the reduced form of $\sqrt{18x^9y^{16}}$?

a) $9x^3y^4$

b) $3x^3y^4\sqrt{2}$

c) $9x^3y^4\sqrt{2}$

d) $3x^3y^4\sqrt{2xy}$

e) $3x^4y^8\sqrt{2x}$

3) Which factors $3x^3+7x^2-12x-28$ completely?

a) $(3x^2-7)(x^2+4)$

b) $(3x^2-7)(x+4)(x-1)$

c) $(3x^2+7)(x-4)(x+1)$

d) $(3x-7)(x-2)(x+2)$

e) $(3x+7)(x-2)(x+2)$

4) Which is the completely reduced form of $\dfrac{\dfrac{1}{x+y}-\dfrac{1}{x}}{y}$?

a) 0
b) 1
c) $\dfrac{1}{x^2+xy}$
d) $-\dfrac{1}{x^2+xy}$
e) x^2+xy

5) The reduced, rationalized form of $\dfrac{3\sqrt{x}-\sqrt{y}}{\sqrt{x}+\sqrt{y}}$ is

a) -3
b) 2
c) $\dfrac{3x-y}{x-y}$
d) $\dfrac{3x-2\sqrt{xy}+y}{x-y}$
e) $\dfrac{3x-4\sqrt{xy}+y}{x-y}$

6) What is the solution set for $\dfrac{4}{x-1}+\dfrac{2}{x+1}=\dfrac{35}{x^2-1}$?

a) 4
b) 5
c) $\dfrac{11}{2}$
d) $\dfrac{13}{2}$
e) $\dfrac{33}{4}$

7) What is the solution set over real numbers for $2x^6+14x^3-16=0$?

a) 1, -8
b) 1, -2
c) $\pm 1, \pm 2$
d) $\pm 1, \pm 8$
e) ± 1

8) What is the solution set for $9-2|3x-1|\leq 5$?

a) $x\geq 1$
b) $x\leq -1$
c) $-\dfrac{1}{3}\leq x\leq 1$
d) $x\leq -\dfrac{1}{3}$ or $x\geq 1$
e) $x\leq -1$ or $x\geq \dfrac{1}{3}$

9) The points A (0,2) , B (-3,-1) and C (-4,3) form an isosceles triangle because:

a) AB= BC
b) BC= CA
c) CA=AB
d) $\angle C = \angle A$
e) $\angle C = \angle B$

10) What is the solution set for $x^{\frac{4}{3}} - 5x^{\frac{2}{3}} + 6 = 0$?

a) 3, 2
b) -3, -2
c) $\sqrt[3]{3}$, $\sqrt[3]{2}$
d) $\sqrt{3}$, $\sqrt{2}$
e) $3\sqrt{3}$, $2\sqrt{2}$

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1) D. $\left[\frac{4a^{-3}}{3b^{-\frac{1}{2}}}\right]^{-1} = \frac{4^{-1}a^{3}}{3^{-1}b^{\frac{1}{2}}}$, since $(a^m)^n = a^{mn}$

Now, since $a^{-1} = \frac{1}{a}$ and $a^{\frac{1}{2}} = \sqrt{a}$, $\frac{4^{-1}a^{3}}{3^{-1}b^{\frac{1}{2}}} = \frac{\frac{1}{4}a^3}{\frac{1}{3}\sqrt{b}}$, which reduces to $\frac{3a^3}{4\sqrt{b}}$.

2) E. $\sqrt{18x^9y^{16}} = \sqrt{9 \cdot 2 \cdot x^8 \cdot x \cdot y^{16}}$. To reduce the radical, find the highest perfect square factor of the coefficient and highest even exponent of the variables. Pull out of the radical square root the perfect square factor and half the even exponents.
That is, use $\sqrt{x^{2n}} = x^n$ to obtain the solution of $3x^4y^8\sqrt{2x}$.

3) E. $3x^3 + 7x^2 - 12x - 28$, First, factor the first two terms and then the second two terms to determine if there is a common binomial factor.

$(x^2)(3x+7) - 4(3x+7)$, 3x + 7 is a factor of each of the two remaining terms.

$(3x+7)(x^2-4)$, which further factors to $(3x+7)(x-2)(x+2)$.

4) D. $\dfrac{\frac{1}{x+y}-\frac{1}{x}}{y} = \dfrac{\frac{x}{x}(\frac{1}{x+y})-\frac{1}{x}(\frac{x+y}{x+y})}{y}$, this is done to have a common denominator.

$$\dfrac{\frac{x}{x}(\frac{1}{x+y})-\frac{1}{x}(\frac{x+y}{x+y})}{y} = \dfrac{\frac{x}{x^2+xy}-\frac{x+y}{x^2+xy}}{y} \text{ or } \dfrac{\frac{-y}{x^2+xy}}{y} \text{ or better yet } \dfrac{\frac{-y}{x^2+xy}}{\frac{y}{1}}$$

Invert, then multiply: $\dfrac{-y}{x^2+xy}\cdot\dfrac{1}{y} = \dfrac{-1}{x^2+xy}$ or $-\dfrac{1}{x^2+xy}$.

5) E. To rationalize the fraction, multiply both numerator and denominator by the irrational conjugate of the denominator, or $\sqrt{x}-\sqrt{y}$.

$$\frac{3\sqrt{x}-\sqrt{y}}{\sqrt{x}+\sqrt{y}}\cdot\frac{\sqrt{x}-\sqrt{y}}{\sqrt{x}-\sqrt{y}} = \frac{3x-3\sqrt{xy}-\sqrt{xy}+y}{x-y} = \frac{3x-4\sqrt{xy}+y}{x-y}$$

6) C. Multiply both sides by the common denominator, which is x^2-1:

$(x^2-1)\cdot\left[\frac{4}{x-1}+\frac{2}{x+1}\right]=\left[\frac{35}{x^2-1}\right]\cdot(x^2-1)$. Then, use $x^2-1=(x+1)(x-1)$ to obtain

$(x+1)(x-1)\cdot\left[\frac{4}{x-1}+\frac{2}{x+1}\right]=\left[\frac{35}{x^2-1}\right]\cdot(x+1)(x-1)$, which reduces after cross canceling to

$4(x+1)+2(x-1)=35$ or $6x+2=35$, yielding $x=\frac{11}{2}$.

7) B. Since the ratio of the exponents in the polynomial is 2:1, use the quadratic procedure:

$2x^6 + 14x^3 - 16 = 0$ Factor as you would a quadratic, recognizing that the x^3 term times an x^3 yields an x^6 term.

$2(x^3 + 8)(x^3 - 1) = 0$, $x = -2$ or $x = 1$

8) D. $9 - 2|3x-1| \le 5$ Subtract 9 from both sides.

$-2|3x-1| \le -4$ Divide by -2 (when dividing by a negative number, reverse the inequality).

$|3x-1| \ge 2$ This becomes two different problems.

$3x - 1 \ge 2$ OR $3x - 1 \le -2$ Solve each part separately to obtain

$x \ge 1$ $\quad x \le -\frac{1}{3}$

9) B. To show that 3 points on a coordinate graph form an isosceles triangle, it is necessary to show that the distance between two of the points equals the distance between two other points. Use the distance formula: $D = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$.

Distance AC = $\sqrt{(0 - -4)^2 + (2 - 3)^2} = \sqrt{16 + 1}$ or $\sqrt{17}$

Distance BC = $\sqrt{(-3 - -4)^2 + (-1 - 3)^2} = \sqrt{1 + 16}$ or $\sqrt{17}$

Distance AB = $\sqrt{18}$

Since AC = BC, the triangle is isosceles.

10) E. $x^{\frac{4}{3}} - 5x^{\frac{2}{3}} + 6 = 0$, The exponents of the trinomial are in a ratio of 2:1. Use quadratic techniques to solve.

Note: When multiplying $x^{\frac{2}{3}}$ by itself, the result will be $x^{\frac{4}{3}}$.

Factor $x^{\frac{4}{3}} - 5x^{\frac{2}{3}} + 6 = 0$ to obtain $(x^{\frac{2}{3}} - 3)(x^{\frac{2}{3}} - 2) = 0$, which yields $x^{\frac{2}{3}} = 3$ or $x^{\frac{2}{3}} = 2$. Raise each to the $\frac{3}{2}$ power or

$$(x^{\frac{2}{3}})^{\frac{3}{2}} = 3^{\frac{3}{2}} \rightarrow x = \sqrt{3^3} \text{ or } \sqrt{27} \text{ or } 3\sqrt{3} \quad \text{OR}$$

$$(x^{\frac{2}{3}})^{\frac{3}{2}} = 2^{\frac{3}{2}} \rightarrow x = \sqrt{2^3} \text{ or } \sqrt{8} \text{ or } 2\sqrt{2}$$