Simplify each of the following.

1. $\dfrac{x^2-9}{2x^2+7x+3}$ = $\dfrac{(x+3)(x-3)}{2x^2+x+6x+3}$ = $\dfrac{(x+3)(x-3)}{x(2x+1)+3(2x+1)}$ = $\dfrac{(x+3)(x-3)}{(x+3)(2x+1)}$

$\dfrac{6x^2}{+1+6}$
2 . 3

= $\boxed{\dfrac{x-3}{2x+1}}$

2. $\dfrac{2x^2+7x+3}{x^2-x-12}$ = $\dfrac{(x+3)(2x+1)}{(x-4)(x+3)}$ = $\boxed{\dfrac{2x+1}{x-4}}$

$\dfrac{-12x^2}{}$
1 . 12
2 . 6
$\boxed{+3 \cdot 4}$

3. $\dfrac{5-x}{x-5}$ = $\dfrac{-1(x-5)}{1(x-5)}$ = $\boxed{-1}$

4. A car is traveling 60 miles per hour. How long does it take the car to travel 360 miles? $D = rt \implies t = \dfrac{D}{r} = \dfrac{360}{60} = \boxed{6 \text{ hours}}$

5. $\dfrac{x^2-x}{x^2-x-2} \div \dfrac{x}{x-2}$ = $\dfrac{x(x-1)}{(x+1)(x-2)} \cdot \dfrac{(x-2)}{x}$ = $\boxed{\dfrac{x-1}{x+1}}$

$\dfrac{-2x^2}{}$
$\boxed{+1 \cdot 2}$

6. $\dfrac{4}{x^2+3x+2} \cdot \dfrac{x^2+2x+1}{8}$ = $\dfrac{(x+1)(x+1)}{(x+1)(x+2)\cdot 2}$ = $\boxed{\dfrac{x+1}{2(x+2)}}$

$-6x^2$

$\dfrac{1 \cdot 6}{+2 \cdot 3}$

7. $\dfrac{2x^2-x-3}{3x^2-8x-3} \cdot \dfrac{3x+1}{2x-3} = $ $\dfrac{2x^2-3x+2x-3}{3x^2-9x+1x-3} \cdot \dfrac{(3x+1)}{(2x-3)} = \dfrac{x(2x-3)+1(2x-3)}{3x(x-3)+1(x-3)}$

$-9x^2$

$\dfrac{+1 \cdot 9}{3 \cdot 3}$

$= \dfrac{(2x-3)(x+1)}{(3x+1)(x-3)} \cdot \dfrac{(3x+1)}{(2x-3)} = \boxed{\dfrac{x+1}{x-3}}$

8. $\sqrt{144} = \boxed{12}$

9. $\sqrt{45} = \sqrt{9 \cdot 5} = \boxed{3\sqrt{5}}$

10. $\sqrt[3]{64} = \sqrt[3]{4 \cdot 4 \cdot 4} = \boxed{4}$

11. $\sqrt[4]{\dfrac{1}{16}} = \dfrac{\sqrt[4]{1 \cdot 1 \cdot 1 \cdot 1}}{\sqrt[4]{2 \cdot 2 \cdot 2 \cdot 2}} = \boxed{\dfrac{1}{2}}$

12. $\dfrac{\sqrt{6ab^2}}{\sqrt{5ab}} \cdot \dfrac{\sqrt{5ab^2}}{\sqrt{54ab}} = \sqrt{\dfrac{2 \cdot 3 \cdot a \cdot b \cdot b \cdot 5 \cdot a (b \cdot b)}{5 \cdot ab \cdot 2 \cdot 3 (3 \cdot 3) ab}} = \boxed{\dfrac{b}{3}}$

13. $\sqrt{75x^7y^4} = \sqrt{25 \cdot 3 \cdot x^6 \cdot x \, y^4} = \boxed{5x^3y^2\sqrt{3x}}$

14. $2\sqrt{5}(\sqrt{7}+3\sqrt{2}) = \boxed{2\sqrt{35}+6\sqrt{10}}$

15. $3\sqrt{50}+\sqrt{72}+\sqrt{27} = 3\sqrt{25 \cdot 2} + \sqrt{36 \cdot 2} + \sqrt{9 \cdot 3}$

$= 15\sqrt{2} + 6\sqrt{2} + 3\sqrt{3}$

$= \boxed{21\sqrt{2}+3\sqrt{3}}$