Algebra and Trigonometry — Joysheet 2
MAT 150, Fall 2013 — D. Ivanšić

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Show all your work!

Solve the equations.

1. (3pts) $7-3(2+x)=5(x+3)-2$

$7-6-3x=5x+15-2$

$1-3x=5x+13 \quad |+3x-13$

$-12=8x$

$x=-\frac{12}{8}=-\frac{3}{2}$

2. (6pts) $x^2+x=2x+30 \quad |-2x-30$

$x^2-x-30=0$

$(x-6)(x+5)=0$

$x=6,-5$

3. (5pts) Solve the equation for t:

$at-a=xt+x \quad |-xt+a$

$at-xt=x+a$

$t(a-x)=x+a \quad |\div(a-x)$

$t=\frac{x+a}{a-x}$

$ac=-8$
prod $=-8$ no such numbs
sum $=-1$
doesn't factor

Simplify.

4. (8pts) $\frac{4x+7}{2x^2+7x-30}-\frac{x+1}{x^2+3x-18}=\frac{4x+7}{(2x-5)(x+6)}-\frac{x+1}{(x+6)(x-3)}$

$ac=-60$
prod $=-60$ $12,-5$
sum $=7$

$2x^2+12x-5x-30$

$=2x(x+6)-5(x+6)$

$=(2x-5)(x+6)$

$=\frac{(4x+7)(x-3)-(x+1)(2x-5)}{(2x-5)(x+6)(x-3)}$

$=\frac{4x^2-5x-21-(2x^2-3x-5)}{(2x-5)(x+6)(x-3)}=\frac{2x^2-2x-16}{(2x-5)(x+6)(x-3)}=\frac{2(x^2-x-8)}{(2x-5)(x+6)(x-3)}$

5. (8pts) $\frac{1-\frac{7x+1}{x^2+5x-14}}{3+\frac{15}{x-2}}=\frac{\frac{x^2+5x-14-(7x+1)}{x^2+5x-14}}{\frac{3(x-2)+15}{x-2}}=\frac{x^2-2x-15}{x^2+5x-14}\cdot\frac{x-2}{3x+9}$

$=\frac{(x-5)(x+3)(x-2)}{(x+7)(x-2)3(x+3)}=\frac{x-5}{3(x+7)}$

Simplify, showing intermediate steps.

6. (2pts) $\sqrt{108} =$ $\sqrt{36\cdot 3} = 6\sqrt{3}$

7. (4pts) $\sqrt{175x^3y^{10}} =$ $\sqrt{25\cdot 7x^2 x (y^5)^2} = 5\sqrt{7}\, x\sqrt{x}\, y^5 = 5xy^5\sqrt{7x}$

8. (5pts) $\sqrt[4]{24x^3y}\sqrt[4]{32x^7y^3} =$ $\sqrt[4]{24\cdot 32\, x^{10} y^4} = \sqrt[4]{3\cdot 4^4 x^8 x^2 y^4} = 4\sqrt[4]{3}\, x^2 \sqrt[4]{x^2}\, y$

$3\cdot 2\cdot 4 \quad 2\cdot 4\cdot 4 \qquad (x^2)^4$

$= 4x^2y\sqrt[4]{3x^2}$

9. (8pts) Simplify. Express answers first in terms of positive exponents, then convert to root notation.

$$\frac{\left(27x^{\frac{2}{5}}y^{\frac{3}{2}}\right)^{\frac{4}{3}}}{\left(36x^{-\frac{7}{5}}y^{-\frac{4}{3}}\right)^{\frac{1}{2}}} = \frac{27^{\frac{4}{3}} x^{\frac{2}{5}\cdot\frac{4}{3}} y^{\frac{3}{2}\cdot\frac{4}{3}}}{36^{\frac{1}{2}} x^{-\frac{7}{5}\cdot\frac{1}{2}} y^{-\frac{4}{3}\cdot\frac{1}{2}}} = \frac{(\sqrt[3]{27})^4 x^{\frac{8}{15}} y^2}{\sqrt{36}\, x^{-\frac{7}{10}} y^{-\frac{2}{3}}} = \frac{27}{2} x^{\frac{8}{15}-(-\frac{7}{10})} y^{2-(-\frac{2}{3})}$$

$$= \frac{27}{2} x^{\frac{16+21}{30}} y^{\frac{6+2}{3}} = \frac{27x^{\frac{37}{30}}y^{\frac{8}{3}}}{2} = \frac{27\sqrt[30]{x^{37}}\sqrt[3]{y^8}}{2}$$

10. (5pts) Simplify.

$(\sqrt{15}+3\sqrt{3})(2\sqrt{15}-5\sqrt{3}) =$ $2\sqrt{15}^2 + 6\sqrt{3}\sqrt{15} - 5\sqrt{15}\sqrt{3} - 15\sqrt{3}^2$

$= 2\cdot 15 + 6\sqrt{45} - 5\sqrt{45} - 15\cdot 3$

$= -15 + \sqrt{45} = -15 + 3\sqrt{5}$

$9\cdot 5$

11. (6pts) Rationalize the denominator.

$$\frac{5\sqrt{3}+2\sqrt{2}}{3\sqrt{2}-2\sqrt{3}} \cdot \frac{3\sqrt{2}+2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}} = \frac{15\sqrt{6}+10\sqrt{3}^2+6\sqrt{2}^2+4\sqrt{6}}{(3\sqrt{2})^2-(2\sqrt{3})^2} = \frac{19\sqrt{6}+30+12}{18-12}$$

$$= \frac{42+19\sqrt{6}}{6}$$