5.2 part 2 Pre-Calculus Math 11

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6. a) $\frac{\sqrt{80}}{\sqrt{10}}$

$\sqrt{\frac{8}{4 \cdot 2}}$

$2\sqrt{2}$

b) $-\frac{2\sqrt{12}}{24\sqrt{3}}$

$-\frac{1}{2}\sqrt{4}$

$-\frac{1}{2} \cdot 2$

$-1$

divide top and bottom by $\sqrt{3}$

c) $\frac{3\sqrt{22}}{\sqrt{11}}$

$3\sqrt{2}$

d) $\frac{3\sqrt{135m^5}}{\sqrt{21m^3}}$, $m > 0$

$\frac{3\sqrt{45m^5}}{\sqrt{7m^3}}$ ← reduce $\frac{m^5}{m^3} = m^2$

$\frac{3\sqrt{9 \cdot 5m^2}}{\sqrt{7}}$

$\frac{3 \cdot 3m\sqrt{5}}{\sqrt{7}}$

$\frac{9m\sqrt{5}}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}}$ ← rationalize the denominator

$\frac{9m\sqrt{35}}{7}$

432

2 | 216 — $2 \cdot 2 \cdot 3 = 12$

2 | 108 — $2 \cdot 2 \cdot 3 = 12$

2 | 54 — 3

2 | 27 < 3 | 9 < 3 | 3

7. a) $\frac{9\sqrt{432p^5} - 7\sqrt{27p^5}}{\sqrt{33p^4}}$, $p > 0$

$\frac{9\sqrt{12^2 \cdot 3p^4 p} - 7\sqrt{9 \cdot 3p^4 p}}{\sqrt{33p^4}}$

$\frac{9 \cdot 12p^2\sqrt{3p} - 7 \cdot 3p^2\sqrt{3p}}{p^2\sqrt{33}}$

$\frac{108p^2\sqrt{3p} - 21p^2\sqrt{3p}}{p^2\sqrt{33}}$

$\frac{p^2\sqrt{3p}(108 - 21)}{p^2\sqrt{33}}$

$\frac{\sqrt{3p}(87)}{\sqrt{33}}$

$\frac{87\sqrt{3p}}{\sqrt{33}} \cdot \frac{\sqrt{33}}{\sqrt{33}}$

$\frac{87\sqrt{99p}}{33}$

$\frac{87 \cdot \sqrt{9 \cdot 11p}}{33}$

$\frac{87 \cdot 3\sqrt{11p}}{33_{11}}$

$\frac{87\sqrt{11p}}{11}$

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7. b) $\frac{6\sqrt[3]{2^2 4 v^7}}{\sqrt[3]{7 \cdot 4 v}}$, $v > 0$ ← reduce $\frac{4}{14}$ and $\frac{v^7}{v}$ first to make the numbers easier to work with

$\frac{6\sqrt[3]{2 v^6}}{\sqrt[3]{7}}$ ← take cubed root of $v^6$

$\frac{6v^2\sqrt[3]{2}}{\sqrt[3]{7}}$

$\frac{6v^2\sqrt[3]{2}\left(\sqrt[3]{7^2}\right)}{\sqrt[3]{7}\left(\sqrt[3]{7^2}\right)}$

$\frac{6v^2\sqrt[3]{98}}{7}$

8. a) $\frac{20}{\sqrt{10}} \cdot \frac{\sqrt{10}}{\sqrt{10}}$

$\frac{20\sqrt{10}}{10}$

$2\sqrt{10}$

b) $\frac{-\sqrt{21}}{\sqrt{7m}}$, $m > 0$ ← reduce $\frac{21}{7}$ first

$-\frac{\sqrt{3}}{\sqrt{m}} \cdot \frac{\sqrt{m}}{\sqrt{m}}$

$-\frac{\sqrt{3m}}{m}$

c) $-\frac{2}{3}\sqrt{\frac{5}{12u}}$, $u > 0$

$\frac{-2\sqrt{5}}{3\sqrt{4 \cdot 3u}}$ ← reduce radical

$\frac{-2\sqrt{5}}{3 \cdot 2\sqrt{3u}}$

$-\frac{\sqrt{5}}{3\sqrt{3u}} \cdot \frac{\sqrt{3u}}{\sqrt{3u}}$

$-\frac{\sqrt{15u}}{3 \cdot 3u}$

$-\frac{\sqrt{15u}}{9u}$

d) $20\sqrt[3]{\frac{6t}{5}}$

$\frac{20\sqrt[3]{6t} \cdot \sqrt[3]{5^2}}{\sqrt[3]{5} \cdot \sqrt[3]{5^2}}$

$\frac{20\sqrt[3]{150t}}{5}$

$4\sqrt[3]{150t}$

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9. a) $2\sqrt{3}+1$ conjugate: $2\sqrt{3}-1$

use FOIL

$(2\sqrt{3}+1)(2\sqrt{3}-1)$

$4\sqrt{9}-2\sqrt{3}+2\sqrt{3}-1$

$4\cdot 3-1$

$12-1$

$11$

b) $7-\sqrt{11}$ conjugate: $7+\sqrt{11}$

$(7-\sqrt{11})(7+\sqrt{11})$

$49+7\sqrt{11}-7\sqrt{11}-11$

$38$

short cut

a) $(2\sqrt{3}+1)(2\sqrt{3}-1)$

$4\cdot 3-1$

$12-1$

$11$

short cut

b) $(7-\sqrt{11})(7+\sqrt{11})$

$49-11$

$38$

c) $8\sqrt{z}-3\sqrt{7}$, $z\geq 0$

conjugate: $8\sqrt{z}+3\sqrt{7}$

$(8\sqrt{z}-3\sqrt{7})(8\sqrt{z}+3\sqrt{7})$

$64z-9\cdot 7$

$64z-63$

d) $19\sqrt{h}+4\sqrt{2h}$, $h\geq 0$

conjugate: $19\sqrt{h}+4\sqrt{2h}$

$(19\sqrt{h}+4\sqrt{2h})(19\sqrt{h}-4\sqrt{2h})$

10. a) $\frac{5}{2-\sqrt{3}}\cdot\frac{2+\sqrt{3}}{2+\sqrt{3}}$

$\frac{10+5\sqrt{3}}{4-3}$

$\frac{10+5\sqrt{3}}{1}$

$10+5\sqrt{3}$

use the shortcut

b) $\frac{7\sqrt{2}}{\sqrt{6}+8}\cdot\frac{\sqrt{6}-8}{\sqrt{6}-8}$

$\frac{7\sqrt{12}-56\sqrt{2}}{6-64}$

$\frac{7\sqrt{4\cdot 3}-56\sqrt{2}}{-58}$

$\frac{14\sqrt{3}-56\sqrt{2}}{-58}$

$\frac{2(7\sqrt{3}-28\sqrt{2})}{-58\ -29}$

$\frac{7\sqrt{3}-28\sqrt{2}}{-29}$

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10. c) $\frac{-\sqrt{7}}{\sqrt{5}-2\sqrt{2}} \cdot \frac{\sqrt{5}+2\sqrt{2}}{\sqrt{5}+2\sqrt{2}}$

$\frac{-\sqrt{35}-2\sqrt{14}}{5-4\cdot 2}$

$\frac{-\sqrt{35}-2\sqrt{14}}{5-8}$

$\frac{(-1)}{(-1)}\frac{-\sqrt{35}-2\sqrt{14}}{-3}$

$\frac{\sqrt{35}+2\sqrt{14}}{3}$

d) $\frac{\sqrt{3}+\sqrt{13}}{\sqrt{3}-\sqrt{13}} \cdot \frac{\sqrt{3}+\sqrt{13}}{\sqrt{3}+\sqrt{13}}$

$\frac{3+\sqrt{39}+\sqrt{39}+13}{3-13}$

$\frac{16+2\sqrt{39}}{-10}$

$\frac{8+\sqrt{39}}{-5}$

11. a) $\frac{4r}{\sqrt{6}r+9} \cdot \frac{\sqrt{6}r-9}{\sqrt{6}r-9}$

$\frac{4r^2\sqrt{6}-36r}{6r^2-81}$

restriction:

denominator cannot equal zero $\rightarrow 6r^2-81 \neq 0$

$6r^2 \neq 81$

$r^2 \neq \frac{81}{6}$

$r^2 \neq \frac{27}{2}$

$r \neq \pm\sqrt{\frac{27}{2}}$

$r \neq \pm\frac{\sqrt{9\cdot 3}}{\sqrt{2}}$

$r \neq \pm\frac{3\sqrt{3}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$r \neq \pm\frac{3\sqrt{6}}{2}$

b) $\frac{18\sqrt{3n}}{\sqrt{24n}} \begin{matrix} \div\sqrt{3n} \\ \div\sqrt{3n} \end{matrix}$

$\frac{18\sqrt{1}}{\sqrt{8}}$

$\frac{18\cdot 1}{\sqrt{4\cdot 2}}$

$\frac{9\cancel{18}}{\cancel{2}\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$\frac{9\sqrt{2}}{2}$

restriction:

$n \geq 0$ because it is in a square root

$n \neq 0$ because it in the denominator

so... $n > 0$

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11. c) $\frac{8}{4-\sqrt{6t}} \cdot \frac{4+\sqrt{6t}}{4+\sqrt{6t}}$

$\frac{32+8\sqrt{6t}}{16-6t}$

$\frac{2(16+4\sqrt{6t})}{2(8-3t)}$

$\frac{16+4\sqrt{6t}}{8-3t}$

restriction:

$8-3t \neq 0$

$8 \neq 3t$

$\frac{8}{3} \neq t$ because it is in the denominator

$t \geq 0$ because it is in the square root

d) $\frac{5\sqrt{3y}}{\sqrt{10}+2} \cdot \frac{\sqrt{10}-2}{\sqrt{10}-2}$

$\frac{5\sqrt{30y}-10\sqrt{3y}}{10-4}$

$\frac{5\sqrt{30y}-10\sqrt{3y}}{6}$

restriction: $y \geq 0$