

Sec. 10.3 Operations With Radical Expressions

like radicals: have same radicand

ex:  $3\sqrt{7} + 5\sqrt{7} = (3+5)\sqrt{7} = 8\sqrt{7}$

unlike radicals:  $4\sqrt{3} + 2\sqrt{2} \rightarrow$  cannot simplify

Simplify

a.  $3\sqrt{7} + 11\sqrt{7} = 14\sqrt{7}$

b.  $9\sqrt{10} - 5\sqrt{10} = 4\sqrt{10}$

c.  $7\sqrt{6} - 2\sqrt{54} = 7\sqrt{6} - 2\sqrt{2 \cdot 3 \cdot 3 \cdot 3}$   
 $= 7\sqrt{6} - 6\sqrt{6} = 1\sqrt{6}$

d.  $\sqrt{5}(\sqrt{8} + 7) = \sqrt{5 \cdot 8} + \sqrt{5 \cdot 7} = 2\sqrt{10} + 7\sqrt{5}$

e.  $(7\sqrt{8} + 2\sqrt{11})(3\sqrt{8} - \sqrt{11})$

$7\sqrt{8}(3\sqrt{8} - \sqrt{11}) + 2\sqrt{11}(3\sqrt{8} - \sqrt{11})$

$7 \cdot 3\sqrt{8 \cdot 8} - 7\sqrt{8 \cdot 11} + 2\sqrt{11} \cdot 3\sqrt{8} + 2\sqrt{11}(-\sqrt{11})$

$21 \cdot 8 - 7\sqrt{2 \cdot 2 \cdot 2 \cdot 11} + 2 \cdot 3\sqrt{11 \cdot 2 \cdot 2 \cdot 2} - 2\sqrt{11 \cdot 11}$

$168 - 7 \cdot 2\sqrt{2 \cdot 11} + 2 \cdot 3 \cdot 2\sqrt{11 \cdot 2} - 2 \cdot 11$

$168 - 14\sqrt{22} + 12\sqrt{22} - 22$

$146 - 2\sqrt{22}$

~~20~~

f.  $(\overset{F}{2} + \overset{L}{\sqrt{10}})(\overset{F}{2} - \overset{L}{\sqrt{10}})$   $(a+b)(a-b) = a^2 - b^2$

F:  $2 \cdot 2 = 4$   
~~O:  $2(-\sqrt{10}) = -2\sqrt{10}$~~   
~~I:  $\sqrt{10} \cdot 2 = 2\sqrt{10}$~~   
L:  $\sqrt{10}(-\sqrt{10}) = -\sqrt{10 \cdot 10} = -10$

$-6$

g.  $\frac{8}{(\sqrt{3} + \sqrt{11})(\sqrt{3} - \sqrt{11})}$

$(a+b)(a-b) = a^2 - b^2$   
 $-\sqrt{11} \cdot \sqrt{11} = -\sqrt{11 \cdot 11}$   
 $9 - 11$   
 $-2$

$\frac{8\sqrt{3} - 8\sqrt{11}}{\sqrt{3 \cdot 3} - \sqrt{11 \cdot 11}} = \frac{8\sqrt{3} - 8\sqrt{11}}{3 - 11} = \frac{8\sqrt{3} - 8\sqrt{11}}{-8} = \frac{8\sqrt{3}}{-8} - \frac{8\sqrt{11}}{-8}$   
 $-\sqrt{3} + \sqrt{11}$

h.  $\frac{\sqrt{5} (2 + \sqrt{5})}{(2 - \sqrt{5})(2 + \sqrt{5})} = \frac{\sqrt{5} \cdot 2 + \sqrt{5 \cdot 5}}{2 \cdot 2 - \sqrt{5 \cdot 5}} = \frac{5 + 2\sqrt{5}}{-1}$   
 $(a-b)(a+b)$   
 $4 - 5$

$\frac{5}{-1} + \frac{2\sqrt{5}}{-1} = -5 - 2\sqrt{5}$

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

$\frac{-2 - 2\sqrt{3}}{2 \cdot 2 - 2\sqrt{3} \cdot 2\sqrt{3}} = \frac{-2 - 2\sqrt{3}}{4 - 4 \cdot 3} = \frac{-2 - 2\sqrt{3}}{4 - 12} = \frac{-2 - 2\sqrt{3}}{-8} = \frac{-2}{-8} - \frac{2\sqrt{3}}{-8} = \frac{1}{4} + \frac{\sqrt{3}}{4} = \frac{1 + \sqrt{3}}{4}$