

MEMORIAL UNIVERSITY OF NEWFOUNDLAND
DEPARTMENT OF MATHEMATICS AND STATISTICS

SECTION 4.1

Math 1090

FALL 2009

SOLUTIONS

1. (a) $25^{\frac{3}{2}} = 5^3 = 125$
(b) $(-8)^{\frac{5}{3}} = (-2)^5 = -32$
(c) $(-16)^{\frac{7}{4}}$ is undefined (we cannot take a fourth root of a negative number)
(d) $81^{-\frac{3}{4}} = 3^{-3} = \frac{1}{27}$
(e) $\left(\frac{1}{125}\right)^{\frac{2}{3}} = \left(\frac{1}{5}\right)^2 = \frac{1}{25}$
(f) $\left(\frac{49}{9}\right)^{-\frac{3}{2}} = \left(\frac{9}{49}\right)^{\frac{3}{2}} = \left(\frac{3}{7}\right)^3 = \frac{27}{343}$
2. (a) $\left(\frac{x}{y^{-3}}\right)^{-2} = \left(\frac{y^{-3}}{x}\right)^2 = \frac{y^{-6}}{x^2} = \frac{1}{x^2y^6} = x^{-2}y^{-6}$
(b) $(x^{-1}y^3)^2(3x^0y)^{-3} = \frac{(x^{-1}y^3)^2}{[3(1)y]^3} = \frac{x^{-2}y^6}{27y^3} = \frac{y^3}{27x^2}$
(c) $\frac{x^{-2}y^{-2}}{(3xy)^{-3}} = \frac{(3xy)^3}{x^2y^2} = \frac{27x^3y^3}{x^2y^2} = 27xy$
(d) $(x^{-4} - 4x^{-2})^{-1} = \frac{1}{x^{-4} - 4x^{-2}} = \frac{1}{\frac{1}{x^4} - \frac{4}{x^2}} = \frac{1}{\frac{1}{x^4} - \frac{4x^2}{x^4}} = \frac{1}{\frac{1-4x^2}{x^4}} = \frac{x^4}{1-4x^2}$
3. (a) $\sqrt{8xy^3} \cdot \sqrt{2xy} = \sqrt{8xy^3 \cdot 2xy} = \sqrt{16x^2y^4} = 4xy^2$
(b) $\sqrt[3]{81x^7} = \sqrt[3]{27x^6 \cdot 3x} = 3x^2\sqrt[3]{3x}$
(c) $\frac{\sqrt[4]{32x}}{\sqrt[4]{2x^5}} = \sqrt[4]{\frac{32x}{2x^5}} = \sqrt[4]{\frac{16}{x^4}} = \frac{2}{x}$
(d) $\sqrt[3]{27\sqrt{64x}} = \sqrt[3]{27 \cdot 8\sqrt{x}} = \sqrt[3]{216\sqrt{x}} = 6\sqrt[3]{\sqrt{x}} = 6\sqrt[6]{x}$

If you find the simplifications in the workings for #3 to be hard to follow, try rewriting the radical as an exponent. For instance, in the last step of part (d), we have

$$6\sqrt[3]{\sqrt{x}} = 6\left(x^{\frac{1}{2}}\right)^{\frac{1}{3}} = 6x^{\left(\frac{1}{2} \cdot \frac{1}{3}\right)} = 6x^{\frac{1}{6}} = 6\sqrt[6]{x}.$$