Math 172 – Quiz #6

December 4, 2008 **Name:** Solution Set
Instructor: Patricia Wrean

Show all work to get full credit. Total: 40 points

1. Simplify the following, leaving any irrational answers in simplified radical form. Assume any variables represent positive real numbers. (8 points)

a) $\left(\frac{27}{64}\right)^{-1/3} = \left(\frac{64}{27}\right)^{1/3} = \frac{4}{3}$

$\frac{4/3}{}$ (2)

b) $\left(\frac{r}{4r^{1/2}t^{-3/2}}\right)^{-2} = \left(\frac{4r^{1/2}t^{-3/2}}{r}\right)^{2}$

$= \left(\frac{4}{r^{1/2}t^{3/2}}\right)^{2}$

$= \frac{16}{rt^3}$

$\frac{16}{rt^3}$ (3)

c) $\frac{6}{\sqrt[3]{4a^2b}}\sqrt[3]{\frac{2ab^2}{2ab^2}}$

$\frac{3\,6\sqrt[3]{2ab^2}}{2ab}$

$\frac{3\sqrt[3]{2ab^2}}{ab}$

$\frac{3\sqrt[3]{2ab^2}}{ab}$ (3)

2. Simplify the following. Assume all variables represent positive real numbers. (7 points)

a) $\sqrt{98p^4q^{19}} \div \sqrt{pq^3}$

$= \sqrt{\frac{98p^4q^{19}}{pq^3}}$

$= \sqrt{98p^3q^{16}}$

$= \sqrt{2 \cdot 49 p^2 p q^{16}}$

$= 7pq^8\sqrt{2p}$

$7pq^8\sqrt{2p}$ (4)

b) $\frac{\sqrt{2}}{\sqrt{2}+\sqrt{10}} \cdot \frac{\sqrt{2}-\sqrt{10}}{\sqrt{2}-\sqrt{10}}$

$= \frac{2-\sqrt{20}}{2-10}$

$= \frac{2-2\sqrt{5}}{-8}$

$= \frac{1-\sqrt{5}}{-4}$

$= \frac{-1+\sqrt{5}}{4}$

$\frac{-1+\sqrt{5}}{4}$ (3)

or $-\frac{1-\sqrt{5}}{4}$

or $\frac{\sqrt{5}-1}{4}$

3. Simplify the following. (5 points)

a) $(-2i)^4$

$= (-2)^4 i^4$

$= 16 \cdot 1$

$= 16$

16 (2)

b) $\frac{5i}{1-2i}\left(\frac{1+2i}{1+2i}\right)$

$= \frac{5i+10i^2}{1-4i^2}$

$= \frac{5i-10}{1+4}$

$= \frac{-10+5i}{5}$

$= -2+i$

$-2+i$ (3)

or $i-2$

4. Find the real solutions to the following equations. (10 points)

a) $x=\sqrt{3x(x+2)}$ $\{0\}$ (3)

$x^2 = 3x(x+2)$

$x^2 = 3x^2 + 6x$

$0 = 2x^2 + 6x$

$0 = 2x(x+3)$

$x = 0, \cancel{-3}$

check

$0 = \sqrt{0 \cdot 2}$ ✓

$-3 = \sqrt{-9(-1)}$ ✗

$\sqrt{}$ is +

b) $17=9-(2b)^3$ $\{-1\}$ (3)

$8 = -(2b)^3$

$-8 = (2b)^3$

$-2 = 2b$

$b = -1$

c) $\sqrt{5-k}-\sqrt{5+k}=2$ $\{-4\}$ (4)

$\sqrt{5-k} = 2 + \sqrt{5+k}$

$8-k = 4 + 4\sqrt{5+k} + 8+k$

$-4\sqrt{5+k} = 2k+4$

$-2\sqrt{5+k} = k+2$

$4(5+k) = k^2+4k+4$

$20+4k = k^2+4k+4$

$0 = k^2 - 16$

$0 = (k-4)(k+4)$

$k = \cancel{4}, -4$

check:

$k=4$

$\sqrt{1} - \sqrt{9} = 2$

$1 - 3 = 2$ ✗

$k=-4$

$\sqrt{9} - \sqrt{1} = 2$

$3 - 1 = 2$ ✓

5. Solve the following equations. Solutions may be complex. (7 points)

a) $30 = 6 - (2z-1)^2$

$\left\{ \frac{1 \pm 2i\sqrt{6}}{2} \right\}$ (3)

$(2z-1)^2 = -24$

$2z-1 = \pm\sqrt{-24}$

$2z-1 = \pm 2i\sqrt{6}$

$2z = 1 \pm 2i\sqrt{6}$

$z = \frac{1 \pm 2i\sqrt{6}}{2}$

b) $(2n-7)^{-2/3} = 1$

$\{3, 4\}$ (4)

$(2n-7)^{2/3} = 1^{-1} = 1$

$(2n-7)^2 = 1^3 = 1$

$2n-7 = \pm 1$

$2n = 7 \pm 1$

$n = \frac{7 \pm 1}{2} = 3, 4$

6. Rewrite as a single radical. (3 points)

$\sqrt[3]{m}\,\sqrt{5m}$

$\sqrt[6]{5^3 m^5}$

or $\sqrt[6]{125 m^5}$

$m^{1/3}(5m)^{1/2}$

$m^{1/3} 5^{1/2} m^{1/2}$

$m^{2/6} 5^{3/6} m^{3/6}$

$5^{3/6} m^{5/6}$

$\sqrt[6]{5^3 m^5}$