Math 131 Test # 4 Name Key

Show all necessary work NEATLY, CLEARLY, and SYSTEMATICALLY. Any understatement and/or incorrect statement may be penalized.

1. (5) Perform indicated operations: $\left(\sqrt{4}+\sqrt{-9}\right)-\left(\sqrt{16}-\sqrt{-25}\right)+\left(\sqrt{36}-\sqrt{-49}\right)$.

$= (2+3i) - (4-5i) + (6-7i)$

$= 2 + 3i - 4 + 5i + 6 - 7i$

$= 4 + i$ //

2. (5) Perform indicated operations: $(8+9i)(10-11i)$.

$= 80 - 88i + 90i - 99i^2$

$= 80 + 2i - 99(-1)$

$= 80 + 2i + 99$

$= 179 + 2i$ //

3. (5) Perform indicated operations and write in standard form: $\dfrac{12+13i}{\sqrt{196}-\sqrt{-225}}$.

$= \dfrac{12 + 13i}{14 - 15i}$

$= \dfrac{12+13i}{14-15i} \cdot \dfrac{14+15i}{14+15i}$

$= \dfrac{168 + 180i + 182i + 195i^2}{196 - 225i^2}$

$= \dfrac{168 + 362i - 195}{196 + 225}$

$= \dfrac{-27 + 362i}{421}$

$= -\dfrac{27}{421} + \dfrac{362}{421}i$ //

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4. (5) Perform indicated operations: $2\sqrt[3]{5x^7} + 4x\sqrt[3]{40x^4} - x\sqrt[3]{135}$.

$8 \quad 5 \qquad 27 \quad 5$

$= 2 \cdot x^2 \sqrt[3]{5x} + 4x \cdot 2x \sqrt[3]{5x} - x \cdot 3 \sqrt[3]{5}$

$= 2x^2 \sqrt[3]{5x} + 8x^2 \sqrt[3]{5x} - 3x \sqrt[3]{5}$

$= 10x^2 \sqrt[3]{5x} - 3x \sqrt[3]{5}$ //

5. (5) Rationalize the denominator: $\dfrac{\sqrt{3}-4\sqrt{2}}{2\sqrt{3}+5\sqrt{2}}$.

$= \dfrac{\sqrt{3}-4\sqrt{2}}{2\sqrt{3}+5\sqrt{2}} \cdot \dfrac{2\sqrt{3}-5\sqrt{2}}{2\sqrt{3}-5\sqrt{2}}$

$= \dfrac{2\cdot 3 - 5\sqrt{6} - 8\sqrt{6} + 20\cdot 2}{(2\sqrt{3})^2 - (5\sqrt{2})^2}$

$= \dfrac{6 - 13\sqrt{6} + 40}{4\cdot 3 - 25\cdot 2}$

$= \dfrac{46 - 13\sqrt{6}}{-38}$ //

$= \dfrac{46}{-38} - \dfrac{13\sqrt{6}}{-38}$

$= -\dfrac{23}{19} + \dfrac{13\sqrt{6}}{38}$ //

6. (5) Solve: $\sqrt{1-4x} - 5 = x$.

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

$(\sqrt{1-4x})^2 = (x+5)^2$

$1 - 4x = x^2 + 10x + 25$

$0 = x^2 + 14x + 24$

$0 = (x+12)(x+2)$

$x+12=0$ | $x+2=0$

$x \neq -12$ | $x = -2$

$\{-2\}$

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7. (8) Solve: $\sqrt{3w+4}-\sqrt{w}=2$.

$\sqrt{3w+4} = 2+\sqrt{w}$

$(\sqrt{3w+4})^2 = (2+\sqrt{w})^2$

$3w+4 = 4+4\sqrt{w}+w$

$2w = 4\sqrt{w}$

$(2w)^2 = (4\sqrt{w})^2$

$4w^2 = 16w$

$4w^2-16w = 0$

$4w(w-4) = 0$

$4w=0 \quad w-4=0$

$w=0 \quad w=4$

$\{0, 4\}$ //

8. (8) Perform indicated operations and simplify:

$$\frac{q^2+6q}{6q+12}\cdot\frac{q^2-5q}{2q+10}\div\frac{q^2+q-30}{4q+8}.$$

$= \frac{q^2+6q}{6q+12}\cdot\frac{q^2-5q}{2q+10}\cdot\frac{4q+8}{q^2+q-30}$

$= \frac{q(q+6)}{6(q+2)}\cdot\frac{q(q-5)}{2(q+5)}\cdot\frac{4(q+2)}{(q+6)(q-5)}$

$= \frac{q^2}{3(q+5)}$ //

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9. (8) Perform indicated operations and simplify: $\frac{m+n}{m+3n}-\frac{m-4n}{m-7n}+\frac{7mn+n^2}{m^2-4mn-21n^2}$.

$$= \frac{m+n}{m+3n} - \frac{m-4n}{m-7n} + \frac{7mn+n^2}{(m-7n)(m+3n)}$$

$$= \frac{(m+n)(m-7n) - (m-4n)(m+3n) + 7mn + n^2}{(m-7n)(m+3n)}$$

$$= \frac{m^2-6mn-7n^2 - (m^2 - mn - 12n^2) + 7mn + n^2}{(m-7n)(m+3n)}$$

$$= \frac{m^2-6mn-7n^2 - m^2 + mn + 12n^2 + 7mn + n^2}{(m-7n)(m+3n)}$$

$$= \frac{2mn + 6n^2}{(m-7n)(m+3n)}$$

$$= \frac{2n(m+3n)}{(m-7n)(m+3n)} = \frac{2n}{m-7n} //$$

10. (8) Solve : $\frac{2}{a+3}-\frac{4}{a^2-4}=\frac{a+1}{a^2+5a+6}$.

LCD $= (a-2)(a+2)(a+3)$; $a \neq -2, -3, 2$

$$\frac{2}{a+3} - \frac{4}{(a-2)(a+2)} = \frac{a+1}{(a+3)(a+2)}$$

$$(a-2)(a+2)(a+3)\left(\frac{2}{a+3} - \frac{4}{(a-2)(a+2)}\right) = \left(\frac{a+1}{(a+3)(a+2)}\right)(a-2)(a+2)(a+3)$$

$$2(a-2)(a+2) - 4(a+3) = (a+1)(a-2)$$

$$2(a^2-4) - 4a - 12 = a^2 - a - 2$$

$$2a^2 - 8 - 4a - 12 = a^2 - a - 2$$

$$a^2 - 3a - 18 = 0$$

$$(a-6)(a+3) = 0$$

$a - 6 = 0$ | $a + 3 = 0$

$a = 6$ | $a \neq -3$

$\{6\}$ //

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11. (8) Solve and express the solution set in interval notation : $\frac{4}{c-2} < \frac{3}{c}$.

$\frac{4}{c-2} - \frac{3}{c} < 0$

$\frac{4c - 3(c-2)}{c(c-2)} < 0$

$\frac{4c - 3c + 6}{c(c-2)} < 0$

$\frac{c+6}{c(c-2)} < 0$

zero

$c + 6 = 0$

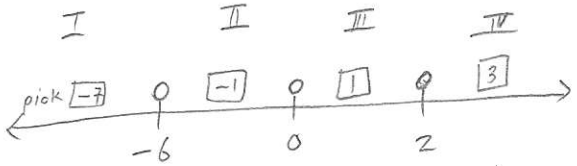
$c = -6$

undefine

$c(c-2) = 0$

$c = 0 \quad c - 2 = 0$

$c = 2$



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$(-\infty, -6) \cup (0, 2)$ //

12. (8) Simplify: $\frac{\left(4x^{\frac{1}{2}}y^{-\frac{1}{3}}\right)\left(x^6y^{-9}\right)^{\frac{1}{3}}}{\left(27x^{-4}y^{-\frac{1}{2}}\right)^{\frac{1}{3}}}$.

$= \frac{4x^{\frac{1}{2}}y^{-\frac{1}{3}} \cdot x^2 y^{-3}}{27^{\frac{1}{3}} x^{-\frac{4}{3}} y^{-\frac{1}{6}}}$

$= \frac{4 x^{\frac{5}{2}} y^{-\frac{10}{3}}}{3 x^{-\frac{4}{3}} y^{-\frac{1}{6}}}$

$= \frac{4 x^{\frac{5}{2}-(-\frac{4}{3})} y^{-\frac{10}{3}-(-\frac{1}{6})}}{3}$

$= \frac{4 x^{\frac{23}{6}} y^{-\frac{19}{6}}}{3}$

$= \frac{4 x^{\frac{23}{6}}}{3 y^{\frac{19}{6}}}$ //

side

$x^{\frac{1}{2}+2}$

$x^{\frac{5}{2}}$

$y^{-\frac{1}{3}+(-3)}$

$y^{-\frac{10}{3}}$

$x^{\frac{5}{2}+\frac{4}{3}}$

$x^{\frac{15+8}{6}}$

$y^{-\frac{10}{3}+\frac{1}{6}}$

$y^{\frac{-20+1}{6}}$