Math 114
Midterm 1
Thu Oct 8, 2009

Name: _____

- **YOU MUST SHOW LOGICAL, NEAT AND ORGANIZED WORK TO EARN FULL CREDIT**
- **IT MUST BE CLEAR HOW YOU ARRIVED AT YOUR ANSWER**
- **PUT A BOX AROUND YOUR FINAL ANSWER**

Write 1.97×10^{-3} in standard notation. **SCORE: ___ / 4 POINTS**

$\boxed{0.00197}$

Write $81{,}700{,}000$ in scientific notation. **SCORE: ___ / 4 POINTS**

$\boxed{8.17\times10^{7}}$

Write using fractional and/or negative exponents (where applicable). **SCORE: ___ / 12 POINTS**

[a] $\left(\sqrt[3]{b}\right)^7 = \boxed{b^{\frac{7}{3}}}$

[b] $\sqrt[9]{p^{18}} = p^{\frac{18}{9}} = \boxed{p^2}$

[c] $\dfrac{1}{\sqrt{n^{11}}} = \dfrac{1}{n^{\frac{11}{2}}} = \boxed{n^{-\frac{11}{2}}}$

Perform the indicated operations and simplify. **Write your final answers using fractional exponents.** **SCORE: ___ / 20 POINTS**

[a] $w^3 w^{\frac{4}{5}}$

$= w^{3+\frac{4}{5}}$

$= \boxed{w^{\frac{19}{5}}}$

[b] $\dfrac{s^{\frac{6}{7}}}{s^{\frac{3}{5}}}$

$= s^{\frac{6}{7}-\frac{3}{5}}$

$= \boxed{s^{\frac{9}{35}}}$

[c] $\dfrac{\sqrt[6]{k}}{\sqrt[10]{k}}$

$= \dfrac{k^{\frac{1}{6}}}{k^{\frac{1}{10}}}$

$= k^{\frac{1}{6}-\frac{1}{10}}$

$= \boxed{k^{\frac{1}{15}}}$

Divide. Rationalize the denominator and simplify. **Write your final answers using radicals.** **SCORE: ___ / 8 POINTS**

$$\frac{\sqrt{5}}{\sqrt{60}} = \sqrt{\frac{1}{12}} = \frac{1}{\sqrt{12}} = \frac{1}{2\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{\sqrt{3}}{6}}$$

Find the center and radius of the circle $x^2 + y^2 + 12x - 8y + 3 = 0$. **SCORE: ___ / 10 POINTS**

$$x^2+12x+36+y^2-8y+16 = -3+36+16$$

$$(x+6)^2 + (y-4)^2 = 49$$

CENTER $\boxed{(-6, 4)}$

RADIUS $\sqrt{49} = \boxed{7}$

Solve the equation $m + \sqrt{2m-2} = 5$ using algebra. **Check your answer(s).** **SCORE: ___ / 14 POINTS**

$$\sqrt{2m-2} = 5-m$$

$$2m-2 = (5-m)^2$$

$$2m-2 = 25-10m+m^2$$

$$0 = m^2-12m+27$$

$$0 = (m-3)(m-9)$$

$$m-3=0 \text{ OR } m-9=0$$

$$\boxed{m=3} \text{ OR } \cancel{m=9}$$

CHECK:

$m = 3$

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

$= 3 + \sqrt{4}$

$= 3+2$

$= 5$ ✓

$m = 9$

$9 + \sqrt{2(9)-2}$

$= 9 + \sqrt{16}$

$= 9+4$

$= 13$ ×

Simplify $\sqrt{294}$.

SCORE: ___ / 5 POINTS

$7\sqrt{6}$

$$\begin{array}{r|l} 2 & 294 \\ 3 & 147 \\ 7 & 49 \\ & 7 \end{array}$$

Find the equation of the circle with center $(-6, 4)$ and radius 7.

SCORE: ___ / 6 POINTS

$$(x--6)^2+(y-4)^2=7^2$$

$$\boxed{(x+6)^2+(y-4)^2=49}$$

Find the distance between the points $(5, -8)$ and $(-1, -5)$. **Write your final answer in simplest radical form.** **SCORE: ___ / 8 POINTS**

$$\sqrt{(-1-5)^2+(-5--8)^2}$$

$$=\sqrt{(-6)^2+(3)^2}$$

$$=\sqrt{36+9}$$

$$=\sqrt{45}$$

$$=\boxed{3\sqrt{5}}$$

Solve the equation $15-4\sqrt{h}=3$ using algebra. **Check your answer(s).**

SCORE: ___ / 10 POINTS

$$-4\sqrt{h}=-12$$

$$\sqrt{h}=3$$

$$\boxed{h=9}$$

CHECK: $15-4\sqrt{9}$

$=15-4(3)$

$=15-12$

$=3$ ✓

Simplify $\sqrt{75a^7v^5r^6}$. **Write your final answer using radicals.** **SCORE: ___ / 6 POINTS**

$$5a^3v^2r^3\sqrt{3av}$$

Rationalize the denominator and simplify. **Write your final answers using radicals.** **SCORE: ___ / 14 POINTS**

[a] $\dfrac{4}{5\sqrt{6}}$

$$= \frac{4}{5\sqrt{6}}\frac{\sqrt{6}}{\sqrt{6}}$$

$$= \frac{4\sqrt{6}}{30}$$

$$= \boxed{\frac{2\sqrt{6}}{15}}$$

[b] $\dfrac{8}{3+\sqrt{5}}$

$$= \frac{8}{3+\sqrt{5}} \cdot \frac{3-\sqrt{5}}{3-\sqrt{5}}$$

$$= \frac{8(3-\sqrt{5})}{9-5}$$

$$= \frac{8(3-\sqrt{5})}{4}$$

$$= 2(3-\sqrt{5}) = \boxed{6-2\sqrt{5}}$$

Perform the indicated operations and simplify. **Write your final answers using radicals.** **SCORE: ___ / 20 POINTS**

[a] $\sqrt{20}+\sqrt{45}$

$$= 2\sqrt{5}+3\sqrt{5}$$

$$= \boxed{5\sqrt{5}}$$

[b] $\left(2\sqrt{10}-\sqrt{3}\right)\left(3\sqrt{5}+\sqrt{6}\right)$

$$= 6\sqrt{50}+2\sqrt{60}-3\sqrt{15}-\sqrt{18}$$

$$= 30\sqrt{2}+4\sqrt{15}-3\sqrt{15}-3\sqrt{2}$$

$$= \boxed{27\sqrt{2}+\sqrt{15}}$$

[c] $\sqrt{5g^7}\sqrt{15g^6}$

$$= \sqrt{75g^{13}}$$

$$= \boxed{5g^6\sqrt{3g}}$$