Math 114
Midterm 2 Version T
Wed May 18, 2011

Name you asked to be called: _____

SCORE: _____ / 140 POINTS

- **YOU MUST SHOW LOGICAL, NEAT AND ORGANIZED WORK TO EARN FULL CREDIT (NO GUESS & CHECK)**
- **IT MUST BE CLEAR HOW YOU ARRIVED AT YOUR ANSWER**
- **PUT A BOX AROUND YOUR FINAL ANSWER**
- **ALL FINAL ANSWERS WHICH ARE RADICALS MUST BE SIMPLIFIED**
- **ALL FRACTIONS MUST BE IN SIMPLEST FORM**

Simplify $\sqrt{84r^{25}a^{36}v^{11}}$. **Write your final answer using radicals.** **SCORE: ___ / 6 POINTS**

$$\sqrt{84}\sqrt{r^{25}}\sqrt{a^{36}}\sqrt{v^{11}}$$
$$= (2\sqrt{21})(r^{12}\sqrt{r})(a^{18})(v^5\sqrt{v})$$
$$= \boxed{2r^{12}a^{18}v^5\sqrt{21rv}}$$

Simplify $\sqrt{252}$. **SCORE: ___ / 6 POINTS**

$$\sqrt{2\times 2\times 3\times 3\times 7}$$
$$= (2\times 3)\sqrt{7}$$
$$= \boxed{6\sqrt{7}}$$

Find the equation of the circle with center $(7,-2)$ and radius 4 . **SCORE: ___ / 6 POINTS**

$$(x-7)^2 + (y-(-2))^2 = 4^2$$
$$\boxed{(x-7)^2 + (y+2)^2 = 16}$$

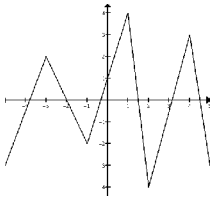
Write using fractional and/or negative exponents (where applicable). **SCORE: ___ / 8 POINTS**

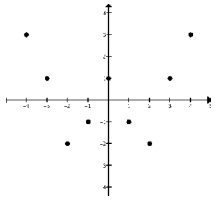
[a] $(\sqrt[4]{n})^{17} = \boxed{n^{\frac{17}{4}}}$

[b] $\sqrt[3]{b^{27}} = b^{\frac{27}{3}} = \boxed{b^9}$

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

Circle the **two** graphs below that represent functions. **SCORE: ___ / 6 POINTS**





Find the center and radius of the circle $x^2 + y^2 + 16x - 8y + 5 = 0$. **SCORE: ___ / 8 POINTS**

$$x^2 + 16x + y^2 - 8y = -5$$
$$x^2 + 16x + 64 + y^2 - 8y + 16 = -5 + 64 + 16$$
$$(x+8)^2 + (y-4)^2 = 75$$

CENTER: $\boxed{(-8, 4)}$ RADIUS: $\sqrt{75} = \boxed{5\sqrt{3}}$

Perform the indicated operations and simplify. **Write your final answers using radicals.** **SCORE: ___ / 14 POINTS**

[a] $\sqrt{21g^9}\sqrt{6g^{12}}$

$$= \sqrt{126}\sqrt{g^{21}}$$
$$= (3\sqrt{14})(g^{10}\sqrt{g})$$
$$= \boxed{3g^{10}\sqrt{14g}}$$

[b] $(2\sqrt{2} + \sqrt{5})(\sqrt{15} - 3\sqrt{6})$

$$= 2\sqrt{30} - 6\sqrt{12} + \sqrt{75} - 3\sqrt{30}$$
$$= 2\sqrt{30} - 6(2\sqrt{3}) + 5\sqrt{3} - 3\sqrt{30}$$
$$= 2\sqrt{30} - 12\sqrt{3} + 5\sqrt{3} - 3\sqrt{30}$$
$$= \boxed{-\sqrt{30} - 7\sqrt{3}}$$

Perform the indicated operations and simplify. **Write your final answers using fractional exponents.** **SCORE: ___ / 10 POINTS**

[a] $\dfrac{\sqrt[6]{w}}{\sqrt[10]{w}}$

$$= \frac{w^{\frac{1}{6}}}{w^{\frac{1}{10}}}$$
$$= w^{\frac{1}{6} - \frac{1}{10}}$$
$$= w^{\frac{5}{30} - \frac{3}{30}}$$
$$= w^{\frac{2}{30}}$$
$$= \boxed{w^{\frac{1}{15}}}$$

[b] $k^6 k^{\frac{5}{8}}$

$$= k^{6 + \frac{5}{8}}$$
$$= k^{\frac{48}{8} + \frac{5}{8}}$$
$$= \boxed{k^{\frac{53}{8}}}$$

Rationalize the denominator and simplify. **SCORE: ___ / 12 POINTS**

[a] $\dfrac{21}{5\sqrt{14}} = \dfrac{21}{5\sqrt{14}}\dfrac{\sqrt{14}}{\sqrt{14}} = \dfrac{21\sqrt{14}}{5(14)} = \dfrac{3\sqrt{14}}{5(2)} = \boxed{\dfrac{3\sqrt{14}}{10}}$

[b] $\dfrac{27}{7 + \sqrt{13}} = \dfrac{27}{7 + \sqrt{13}}\dfrac{7 - \sqrt{13}}{7 - \sqrt{13}} = \dfrac{27(7 - \sqrt{13})}{7^2 - (\sqrt{13})^2}$

$$= \frac{27(7 - \sqrt{13})}{49 - 13} = \frac{27(7 - \sqrt{13})}{36}$$
$$= \frac{3(7 - \sqrt{13})}{4} = \boxed{\frac{21 - 3\sqrt{13}}{4}}$$

Solve the equation $17-3\sqrt{h}=5$ using algebra. **Check your answer(s).** **SCORE: ___ / 8 POINTS**

$-3\sqrt{h}=-12$

$\sqrt{h}=4$

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

$\boxed{h=16}$

CHECK:

$17-3\sqrt{16}$

$=17-3(4)$

$=17-12$

$=5$ ✓

Solve the equation $m+\sqrt{31-6m}=4$ using algebra. **Check your answer(s).** **SCORE: ___ / 12 POINTS**

$\sqrt{31-6m}=4-m$

$(\sqrt{31-6m})^2=(4-m)^2$

$31-6m=16-8m+m^2$

$0=m^2-2m-15$

$0=(m-5)(m+3)$

$m=5$ OR $\boxed{m=-3}$

CHECK:

$m=5$

$5+\sqrt{31-6(5)}$

$=5+\sqrt{31-30}$

$=5+\sqrt{1}$

$=5+1$

$=6$ ✗

$m=-3$

$-3+\sqrt{31-6(-3)}$

$=-3+\sqrt{31+18}$

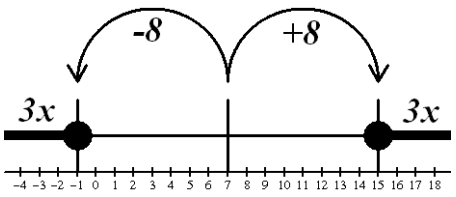
$=-3+\sqrt{49}$

$=-3+7$

$=4$ ✓

Solve $|7-3x|\geq 8$. **SCORE: ___ / 10 POINTS**

The distance between 7 and $3x$ is greater than or equal to 8



$3x\leq -1$ OR $3x\geq 15$

$\boxed{x\leq -\frac{1}{3} \text{ OR } x\geq 5}$

ALTERNATE SOLUTION:

$7-3x\geq 8$ OR $7-3x\leq -8$

$-3x\geq 1$ OR $-3x\leq -15$

$\boxed{x\leq -\frac{1}{3} \text{ OR } x\geq 5}$

Find the distance between the points $(-6, 5)$ and $(-4, -3)$. **Write your final answer using radicals.** **SCORE: ___ / 6 POINTS**

$$\sqrt{(-4-(-6))^2+(-3-5)^2}$$
$$=\sqrt{2^2+(-8)^2}$$
$$=\sqrt{4+64}$$
$$=\sqrt{68}$$
$$=\boxed{2\sqrt{17}}$$

Divide. Rationalize the denominator and simplify. **SCORE: ___ / 6 POINTS**

$$\frac{\sqrt{5}}{\sqrt{90}}=\frac{\sqrt{5}}{\sqrt{5}\sqrt{18}}=\frac{1}{\sqrt{18}}=\frac{1}{3\sqrt{2}}=\frac{1}{3\sqrt{2}}\frac{\sqrt{2}}{\sqrt{2}}=\frac{\sqrt{2}}{3(2)}=\boxed{\frac{\sqrt{2}}{6}}$$

Translate the following sentence into an absolute value equation or inequality. **SCORE: ___ / 6 POINTS**

"x is at least 10 away from 7"

The distance between x and 7 is greater than or equal to 10

$\boxed{|x-7|\geq 10}$

If $f(x)=2x^2-5x-6$, find $f(a-3)$. **SCORE: ___ / 8 POINTS**

$$2(a-3)^2-5(a-3)-6$$
$$=2(a^2-6a+9)-5a+15-6$$
$$=2a^2-12a+18-5a+15-6$$
$$=\boxed{2a^2-17a+27}$$

The equation $9-|11-4x|=2$ has two solutions. One solution is $x=1$. Find the other solution. **SCORE: ___ / 8 POINTS**

Check your answer.

$$-|11-4x|=-7$$
$$|11-4x|=7$$
$$11-4x=7 \quad \text{OR} \quad 11-4x=-7$$
$$-4x=-4 \quad \text{OR} \quad -4x=-18$$
$$x=1 \quad \text{OR} \quad \boxed{x=\frac{9}{2}}$$

CHECK:
$$9-\left|11-4\left(\frac{9}{2}\right)\right|$$
$$=9-|11-18|$$
$$=9-|-7|$$
$$=9-7$$
$$=2\ \checkmark$$