Math 150 Test 4 Name: [illegible]

Show all necessary steps Clearly, Neatly, and Systematically to receive full credit. Any incorrect statement will be penalized.

1. (6) Solve: $\sqrt{-k+2}+2=k$

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

$$\left(\sqrt{-k+2}\right)^2 = (k-2)^2$$

$$-k+2 = k^2-4k+4$$

$$0 = k^2-3k+2$$

$$0 = (k-2)(k-1)$$

$$k-2=0 \qquad k-1=0$$

$$k=2 \qquad k=1$$

$$\{2\}$$

2. (6) Simplify: $\left(w^{\frac{2}{3}}x^{-\frac{1}{2}}\right)^{-2}\left(2w^{-\frac{3}{4}}x^{-\frac{5}{8}}\right)^{-6}$

$$= w^{-\frac{4}{3}} x \cdot 2^{-6} w^{\frac{9}{2}} x^{\frac{15}{4}}$$

$$= \frac{1}{2^6} w^{-\frac{4}{3}+\frac{9}{2}} x^{1+\frac{15}{4}}$$

$$= \frac{1}{64} w^{\frac{19}{6}} x^{\frac{19}{4}}$$

3. (6) Simplify:

a. $\frac{5}{4i}$

$$= \frac{5}{4i} \cdot \frac{i}{i}$$

$$= \frac{5i}{4i^2}$$

$$= \frac{5}{-4} i \quad //$$

b. $(\sqrt{121}+\sqrt{-169})(\sqrt{225}-\sqrt{-289})$

$$= (11 + 13i)(15 - 17i)$$

$$= 165 - 187i + 195i - 221i^2$$

$$= 165 + 8i + 221$$

$$= 386 + 8i \quad //$$

4. (6) It takes one team 9 days less than another to survey 1000 people. If the teams work together, it takes them 20 days to complete such a survey. How long will it take each to do the survey alone?

	r	t	wc
team 1	$\frac{1}{x-9}$	$x-9$	1
team 2	$\frac{1}{x}$	x	1

$$\left(\frac{1}{x-9} + \frac{1}{x}\right) \cdot 20 = 1$$

$$\frac{20}{x-9} + \frac{20}{x} = 1$$

$$x(x-9)\left(\frac{20}{x-9} + \frac{20}{x}\right) = 1 \cdot x \cdot (x-9)$$

$$20x + 20(x-9) = x^2 - 9x$$

$$20x + 20x - 180 = x^2 - 9x$$

$$0 = x^2 - 49x + 180$$

$$0 = (x-45)(x-4)$$

$x - 45 = 0$ $\quad$ $x - 4 = 0$

$x = 45$ $\quad$ $x \cancel{=} 4$

team 1 takes 36 days and
team 2 takes 45 days //

5. (6) Simplify:

a. $x\sqrt[3]{-48x^4y^6} - x^2y\sqrt[3]{-162xy^3} + 7\sqrt[3]{6x^7y^6}$

$-8 \quad 6 \qquad -27 \quad 6$

$= x\cdot(-2xy^2)\sqrt[3]{6x} - x^2y\cdot(-3y)\sqrt[3]{6x} + 7\cdot(x^2y^2)\sqrt[3]{6x}$

$= -2x^2y^2\sqrt[3]{6x} + 3x^2y^2\sqrt[3]{6x} + 7x^2y^2\sqrt[3]{6x}$

$= 8x^2y^2\sqrt[3]{6x}$ //

b. $\sqrt{\sqrt[4]{\sqrt[6]{\sqrt[8]{x^{10}}}}}$

$= (((x^{\frac{10}{8}})^{\frac{1}{6}})^{\frac{1}{4}})^{\frac{1}{2}}$

$= x^{\frac{5}{192}}$ //

6. (6) The intensity of light received form a light source varies inversely as the square of the distance from the light source. If a photographer, 16 feet away from his subject, has a light meter reading of 4 foot-candles of luminance, what will the meter read if the photographer moves in for a close-up 2 feet away from the subject. (*make sure define all the variables and set up formula*)

I = intensity of light

d = distance.

$I = \dfrac{k}{d^2} \longrightarrow I = \dfrac{1024}{d^2}$

$4 = \dfrac{k}{16^2} \qquad I = \dfrac{1024}{(2)^2}$

$4 = \dfrac{k}{256} \qquad I = 256$ //

$1024 = k$

7. (6) Solve: $(a^2+6a)^{\frac{1}{4}} = 2(a-1)^{\frac{1}{4}}$

$$\sqrt[4]{a^2+6a} = 2\sqrt[4]{a-1}$$

$$\left(\sqrt[4]{a^2+6a}\right)^4 = \left(2\sqrt[4]{a-1}\right)^4$$

$$a^2+6a = 16(a-1)$$

$$a^2+6a = 16a-16$$

$$a^2-10a+16 = 0$$

$$(a-8)(a-2) = 0 \qquad \{8;2\}$$

$$a-8=0 \qquad a-2=0$$

$$a=8 \qquad a=2$$

8. (6) Solve: $(10-\sqrt{t})^2-4(10-\sqrt{t})-45=0$.

Let $u = 10-\sqrt{t}$

$$u^2-4u-45=0$$

$$(u-9)(u+5)=0$$

$$u-9=0 \qquad u+5=0$$

$$10-\sqrt{t}-9=0 \qquad 10-\sqrt{t}+5=0$$

$$1-\sqrt{t}=0 \qquad 15-\sqrt{t}=0$$

$$1=\sqrt{t} \qquad 15=\sqrt{t}$$

$$1=t \qquad 225=t$$

$$\{1, 225\}$$

9. (6) Rationalize the denominator: $\dfrac{2\sqrt{x}-3\sqrt{y}}{\sqrt{4x}+\sqrt{9y}}$

$$= \frac{2\sqrt{x}-3\sqrt{y}}{2\sqrt{x}+3\sqrt{y}} \cdot \frac{2\sqrt{x}-3\sqrt{y}}{2\sqrt{x}-3\sqrt{y}}$$

$$= \frac{4x-12\sqrt{xy}+9y}{4x-9y} \; //$$

10. (6) Solve: $\sqrt{x+16}+\sqrt{x+9}=7$

$$\sqrt{x+16} = 7-\sqrt{x+9}$$

$$(\sqrt{x+16})^2 = (7-\sqrt{x+9})^2$$

$$x+16 = 49-14\sqrt{x+9}+x+9$$

$$x+16 = 58+x-14\sqrt{x+9}$$

$$-42 = -14\sqrt{x+9}$$

$$3 = \sqrt{x+9}$$

$$(3)^2 = (\sqrt{x+9})^2$$

$$9 = x+9$$

$$0 = x$$

$\{0\}$

11. (6) Simplify: $\dfrac{\sqrt{36}-\sqrt{-49}}{\sqrt{64}+\sqrt{-81}}$

$$= \frac{6-7i}{8+9i}$$

$$= \frac{6-7i}{8+9i} \cdot \frac{8-9i}{8-9i}$$

$$= \frac{48-54i-56i+63i^2}{64-81i^2}$$

$$= \frac{-15 \quad -110i}{64+81}$$

$$= -\frac{15}{145} - \frac{110}{145}i \quad = -\frac{3}{29} - \frac{22}{29}i \ //$$

12. (6) In a scale drawing, a 280-foot antenna tower is drawn $7\frac{1}{2}$ inches high. The building next to it is drawn $2\frac{1}{4}$ inches high. How tall is the actual building?

$\dfrac{\text{building}}{\text{pic}}$ let x = height of actual building.

$$\frac{280}{7\frac{1}{2}} = \frac{x}{2\frac{1}{4}}$$

$$\frac{280}{\frac{15}{2}} = \frac{x}{\frac{9}{4}}$$

$$280 \cdot \frac{9}{4} = \frac{15}{2}x \qquad x = 84$$

$$630 = \frac{15}{2}x$$

$$630 \cdot \frac{2}{15} = x$$

the building is 84 ft tall.

13. (6) Solve by completing the square method: $4m^2+2m+3=0$

$$4m^2+2m=-3$$

$$m^2+\frac{1}{2}m=-\frac{3}{4}$$

$$m^2+\frac{1}{2}m+\frac{1}{16}=-\frac{3}{4}+\frac{1}{16}$$

$$\left(m+\frac{1}{4}\right)^2=-\frac{11}{16}$$

$$m+\frac{1}{4}=\pm\sqrt{-\frac{11}{16}}$$

$$m+\frac{1}{4}=\pm\frac{\sqrt{11}}{4}i$$

$$m=-\frac{1}{4}\pm\frac{\sqrt{11}}{4}i \quad //$$

14. (6) Solve: $x^{\frac{2}{3}}+6x^{\frac{1}{3}}=16$

Let $u=x^{\frac{1}{3}}=\sqrt[3]{x}$

$$u^2+6u=16$$

$$u^2+6u-16=0$$

$$(u+8)(u-2)=0$$

$$u+8=0 \qquad u-2=0$$

$$\sqrt[3]{x}+8=0 \qquad \sqrt[3]{x}-2=0$$

$$\sqrt[3]{x}=-8 \qquad \sqrt[3]{x}=2$$

$$x=(-8)^3 \qquad x=(2)^3$$

$$x=-512 \qquad x=8$$

$$\{-512, 8\} \quad //$$

15. (3,4) Let the equation be $-x^2 = \frac{7x+1}{5}$. $\rightarrow -5x^2 = 7x+1 \rightarrow 0 = 5x^2+7x+1$

a. Use the discriminant to determine the number and type of solutions.

$$b^2 - 4ac = (7)^2 - 4(5)(1)$$
$$= 49 - 20$$
$$= 29$$

2 real irrational solutions //

b. Use the quadratic formula to solve the equation.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
$$= \frac{-(7) \pm \sqrt{29}}{2(5)}$$
$$= \frac{-7 \pm \sqrt{29}}{10} \quad //$$

16. (6) Solve: $3(2-y)^2 + 7 = 32$

$$3(2-y)^2 = 25$$
$$(2-y)^2 = \frac{25}{3}$$
$$2-y = \pm\sqrt{\frac{25}{3}}$$
$$2-y = \pm\frac{5}{\sqrt{3}}$$
$$2-y = \pm\frac{5\sqrt{3}}{3}$$
$$-y = -2 \pm \frac{5\sqrt{3}}{3}$$
$$y = 2 \pm \frac{5\sqrt{3}}{3} \quad //$$