Name and section: _____

Instructor's name: _____

- **Please do not open exam until instructed to begin.**
- This exam is to be completed in the allotted time period of 2 hours.
- There are 22 problems which appear on the fronts and backs of the pages of this exam.
- You may earn a total of 100 points.
- Read each question carefully.
- Credit may not be given without sufficient supporting work.
- Simplify answers when possible.
- The use of cell phones, books, or notes are not permitted while taking this exam.
- Calculators are allowed.

1. [4 points] Factor $w^2 - 7w + 12$.

2. [4 points] Completely factor $ax^2 + bx^2 - 25a - 25b$.

3. [5 points] Simplify $\dfrac{t^2 + 8t + 15}{4t^2 + 8t - 12}$.

4. [5 points] Simplify $\dfrac{16x^4}{2x + 4} \div \dfrac{3x}{(x - 2)(x + 2)}$.

5. [5 points] Simplify $\dfrac{2}{x-8} - \dfrac{x}{x+3}$

6. [5 points] Completely simplify $\dfrac{4x-9}{x^2-5x+6} + \dfrac{x+2}{x^2-8x+12}$.

7. [4 points] Simplify $\dfrac{\dfrac{a}{3b} - \dfrac{1}{2}}{\dfrac{7}{3b} - \dfrac{4}{a}}$.

8. [4 points] Solve $\dfrac{5}{4} = \dfrac{4x+5}{x+10} + 6$.

9. [4 points] A contractor estimated that 35 square feet of window space will be allowed for every 180 square feet of floor space. Using this estimate, how much window space will be allowed for 3600 square feet of floor space?

10. [4 points] Combine. Assume that all variables represent nonnegative real numbers. $\sqrt{175x} - 3\sqrt{80x} - \sqrt{63x}$.

11. [4 points] Let $h(t) = 4t^2 - 2t + 5$. Find $h(4)$ and $h(-1)$. Be sure to simplify your answers.

12. [4 points] Solve $\sqrt{5x + 9} - 4 = 4$.

13. [4 points] Simplify $3 - \sqrt{-28}$.

14. [6 points] The number of AUD (Australian dollars) received varies directly as the number of USD (U.S. dollars) exchanged. In 2009, one could exchange 700 USD for 1085 AUD.

    (a) Write an equation relating AUD to USD.

    (b) In 2009, 1000 USD could be exchanged for how many AUD?

15. [4 points] Solve by using the square root property. $(6x - 3)^2 = 2$.

16. [4 points] The Wollombi Falls in Australia have a height of 1100 feet. A pebble is thrown upward from the top of the falls with an initial velocity of 30 feet per second. The height of the pebble after t seconds is given by the equation $h = -16t^2 + 30t + 1100$. How long after the pebble is thrown will it be 550 feet from the ground? Round to the nearest tenth of a second.

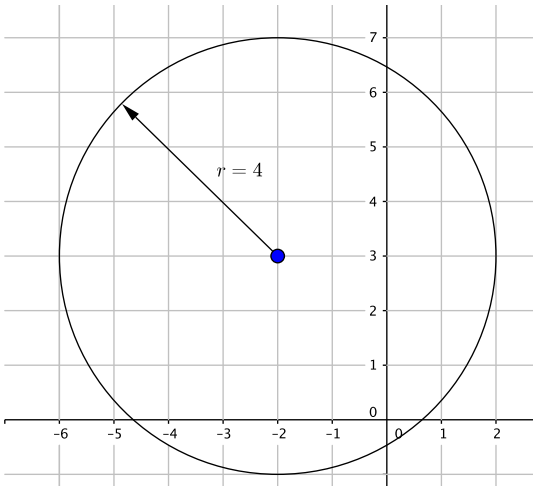
17. [4 points] Tanya runs diagonally across a rectangular field, from corner to corner. The total distance she ran was 40 yards. If one side of the rectangular field is 24 yards, what is the length of the other side of the field? Keep answers in simplified radical form.

18. [8 points] Given $f(x) = x^2 + 2x - 3$. Identify the vertex, y-intercept, x-intercept(s), axis of symmetry. In order to receive full credit, you must show your work.

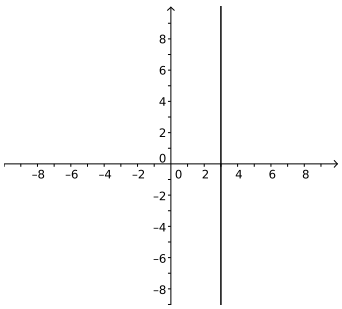
19. [4 points] Solve $|x - 3| + 2 = 13$.

20. [4 points] Find the distance between $(4, 10)$ and $(1, 15)$.

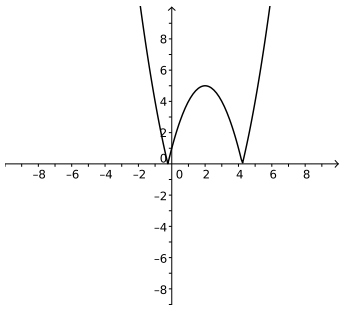
21. [6 points] Find the equation of the circle graphed below.



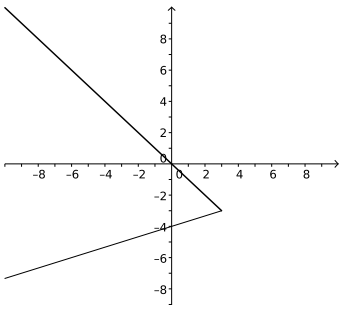
22. [4 points] Determine whether each graph represents a function.



Yes or No



Yes or No



Yes or No

Solutions

1. Factor $w^2 - 7w + 12$.

$w^2 - 3w - 4w + 12$	2 pts to here
$w(w-3) - 4(w-3)$	3 pts to here
$(w-3)(w-4)$	4 pts to here

2. Completely factor $ax^2 + bx^2 - 25a - 25b$.

$x^2(a+b) - 25(a+b)$	2 pts to here
$(x^2-25)(a+b)$	3 pts to here
$(x-5)(x+5)(a-b)$	4 pts to here

3. Simplify $\dfrac{t^2+8t+15}{4t^2+8t-12}$.

Partial factoring of only the numerator	2 pts
Partial factoring of only the denominator	2 pts
$\dfrac{(t+5)(t+3)}{4(t-1)(t+3)}$	4 pts to here
$\dfrac{t+5}{4(t-1)}$	5 pts to here

4. Simplify $\dfrac{16x^4}{2x+4} \div \dfrac{3x}{(x-2)(x+2)}$.

$\frac{16x^4}{2(x+2)} \div \frac{3x}{(x-2)(x+2)}$	1 pt
$\frac{16x^4}{2(x+2)} \times \frac{(x-2)(x+2)}{3x}$	3 pts to here
$\frac{8x^3(x-2)}{3}$	5 pts to here

5. Simplify $\dfrac{2}{x-8} - \dfrac{x}{x+3}$

$\frac{2(x+3)}{(x-8)(x+3)} - \frac{x(x-8)}{(x-8)(x+3)}$	2 pts to here
$\frac{2(x+3)-x(x-8)}{(x-8)(x+3)}$	3 pts to here
$\frac{2x+6-x^2+8x}{(x-8)(x+3)}$	4 pts to here
$\frac{-x^2+10x+6}{(x-8)(x+3)}$	5 pts to here

6. Completely simplify $\dfrac{4x-9}{x^2-5x+6} + \dfrac{x+2}{x^2-8x+12}$.

$\frac{(4x-9)(x-6)}{(x-3)(x-2)(x-6)} + \frac{(x+2)(x-3)}{(x-6)(x-2)(x-3)}$	2 pts
$\frac{4x^2-33x+54+x^2-x-6}{(x-2)(x-6)(x-3)}$	3 pts to here
$\frac{5x^2-34x+48}{(x-2)(x-6)(x-3)}$	4 pts to here
$\frac{5x-24}{(x-6)(x-3)}$	5 pts to here

7. Simplify $\dfrac{\dfrac{a}{3b}-\dfrac{1}{2}}{\dfrac{7}{3b}-\dfrac{4}{a}}$.

Method 1	
$\dfrac{6ab}{6ab}\left(\dfrac{\dfrac{a}{3b}-\dfrac{1}{2}}{\dfrac{7}{3b}-\dfrac{4}{a}}\right)$	2 pts to here
$\dfrac{2a^2-3ab}{14a-24b}$	4 pts to here
Method 2	
$\dfrac{\dfrac{2a}{6b}-\dfrac{3b}{6b}}{\dfrac{7a}{3ab}-\dfrac{12b}{3ab}}$	1 pt to here
$\dfrac{\dfrac{2a-3b}{6b}}{\dfrac{7a-12b}{3ab}}$	2 pts to here
$\dfrac{2a-3b}{6b}\times\dfrac{3ab}{7a-12b}$	3 pts to here
$\dfrac{a(2a-3b)}{2(7a-12b)}$ or $\dfrac{2a^2-3ab}{14a-24b}$	4 pts to here

8. Solve $\dfrac{5}{4}=\dfrac{4x+5}{x+10}+6$.

$5(x+10)=4(4x+5)+4(6)(x+10)$	1 pt to here
$5x+50=16x+20+24x+240$	2 pts to here
$5x+50=40x+260$	3 pts to here
$-6=x$	4 pts to here

9. A contractor estimated that 35 square feet of window space will be allowed for every 180 square feet of floor space. Using this estimate, how much window space will be allowed for 3600 square feet of floor space?

$\dfrac{x}{3600}=\dfrac{35}{180}$ or $\dfrac{x}{35}=\dfrac{3600}{180}$ or $\dfrac{35}{180}=\dfrac{x}{3600}$	2 pts to here
$180x=126000$	3 pts to here
$x=700$ square feet	4 pts to here
(3 pts for correct solution, but no units are given)	

10. Combine. Assume that all variables represent nonnegative real numbers.
$\sqrt{175x}-3\sqrt{80x}-\sqrt{63x}$.

$5\sqrt{7x}-12\sqrt{5x}-3\sqrt{7x}$	2 pts to here
$2\sqrt{7x}-12\sqrt{5x}$	4 pts to here

11. Let $h(t) = 4t^2 - 2t + 5$. Find $h(4)$ and $h(-1)$. Be sure to simplify your answers.

$h(4) = 61$	2 pts
$h(-1) = 4(-1)^2 - 2(-1) + 5$	1 additional point
$h(-1) = 11$	1 additional point

12. Solve $\sqrt{5x+9} - 4 = 4$.

$\sqrt{5x+9} = 8$	1 pt to here
$5x + 9 = 64$	2 pts to here
$5x = 55$	3 pts to here
$x = 11$	4 pts to here

13. Simplify $3 - \sqrt{-28}$.

$3 - \sqrt{-1}\sqrt{28}$	1 pts to here
$3 - 2\sqrt{-1}\sqrt{7}$	2 pts to here or
$3 - i\sqrt{28}$	3 pts to here
$3 - 2i\sqrt{7}$	4 pts to here

14. The number of AUD (Australian dollars) received varies directly as the number of USD (U.S. dollars) exchanged. In 2009, one could exchange 700 USD for 1085 AUD.

    (a) Write an equation relating AUD to USD.

    (b) In 2009, 1000 USD could be exchanged for how many AUD?

(a) $A = kU$ (or other variables)	2 pts to here
(a) $A = \frac{1085}{700}U$ or $A = \frac{31}{20}U$	3 pts to here
(b) $A = \frac{31}{20} \cdot 1000$ or $A = 1550$	5 pts to here
(b) 1550 AUD	6 pts to here

15. Solve by using the square root property. $(6x - 3)^2 = 2$.

$6x - 3 = \pm\sqrt{2}$	1 pt to here
$6x = 3 + \sqrt{2}$	
$x = \dfrac{3+\sqrt{2}}{6}$	2 pts to here
$6x = 3 - \sqrt{2}$	3 pts to here
$x = \dfrac{3-\sqrt{2}}{6}$	4 pts

16. The Wollombi Falls in Australia have a height of 1100 feet. A pebble is thrown upward from the top of the falls with an initial velocity of 30 feet per second. The height of the pebble after t seconds is given by the equation $h = -16t^2 + 30t + 1100$. How long after the pebble is thrown will it be 550 feet from the ground? Round to the nearest tenth of a second.

$550 = -16t^2 + 30t + 1100$ or $0 = -16t^2 + 30t + 550$	1 pt to here
$t = \frac{-30 \pm \sqrt{30^2 - 4(-16)(550)}}{2(-16)}$	2 pt to here
$t = 6.875$	3 pts to here
6.9 seconds	4 pts to here

17. Tanya runs diagonally across a rectangular field, from corner to corner. The total distance she ran was 40 yards. If one side of the rectangular field is 24 yards, what is the length of the other side of the field? Keep answers in simplified radical form.

$24^2 + x^2 = 40^2$	1 pt to here
$x^2 = 224$	2 pts to here
$x = \sqrt{224}$ or $x = \pm\sqrt{224}$	3 pts to here
$x = 4\sqrt{14}$ yards	4 pts to here (3 pts no units)

18. Given $f(x) = x^2 + 2x - 3$. Identify the vertex, y-intercept, x-intercept(s), axis of symmetry. In order to receive full credit, you must show your work.

vertex $(-1, -4)$	Add 2 pts
x-intercepts $(-3, 0)$, $(1, 0)$	Add 2 pts for each
y-intercept $(0, -3)$	Add 1 pt
Axis of Symmetry $x = -1$	Add 1 pt

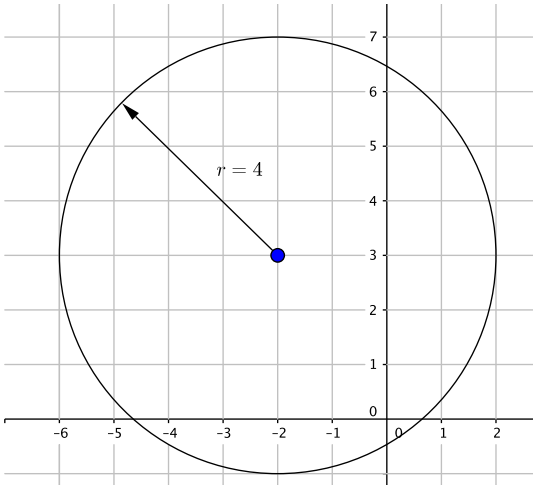
19. Solve $|x - 3| + 2 = 13$.

$\|x - 3\| = 11$	1 pt
$x - 3 = 11$	
$x = 14$	2 pt
$x - 3 = -11$	3 pt to here
$x = -8$	4 pt to here

20. Find the distance between $(4, 10)$ and $(1, 15)$.

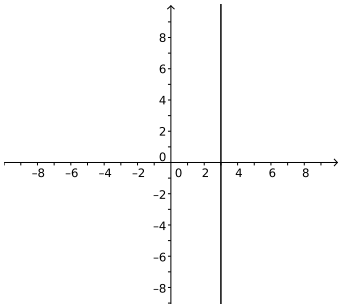
$d = \sqrt{(1-4)^2 + (15-10)^2}$	1 pt to here
$d = \sqrt{(-3)^2 + (5)^2}$	2 pts to here
$d = \sqrt{9 + 25}$	3 pts to here
$d = \sqrt{34}$	4 pts to here

21. Find the equation of the circle graphed below.

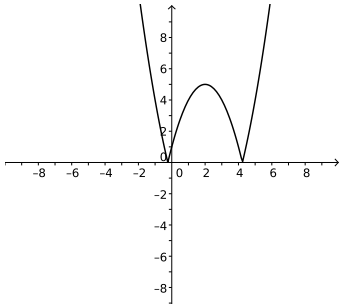


Correct form of the equations	$(x-h)^2+(y-k)^2=r^2$	Add 2 points
Correct center of the circle	$(-2,3)$	Add 2 points
Correct radius of the equation	$r=4$	Add 2 points

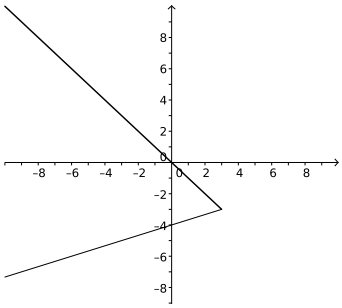
22. Determine whether each graph represents a function.



Yes or No



Yes or No



Yes or No

No (1 pt) Yes (1 pt) No (1 pt)
Add 1 point if all 3 correct