Final Exam
Math 006 College Algebra I
Fall 2005

Please do all problems, showing all work. Points are written to the left of each problem.

14 pts 1. Factor completely.

(a) $25 - 9x^2$

(b) $4x^2 - 4x - 15$

7 pts 2. Add and simplify, writing your answer in factored form: $\dfrac{2}{x^2-9} + \dfrac{x}{x+3}$

5 pts 3. If $x = -5$ and $y = 3$, find $|x - y|$.

5 pts 4. Evaluate $(-27)^{2/3}$.

7 pts 5. Given that x and y are positive, simplify $\dfrac{(x^{1/2}y^{1/3})^2}{(x^{-1}y)^3}$, writing your answer so that each variable occurs only once.

14 pts 6. Solve the equations.

(a) $3x - 1 = 1 - 4x$

(b) $\dfrac{2}{x} + \dfrac{3}{x} = 7$

28 pts 7. Find all real solutions to the following equations.

(a) $2x^2 - x - 6 = 0$

(b) $\sqrt{2x-3} = x - 3$

(c) $x^4 - x^2 - 2 = 0$

(d) $|3x - 2| = 4$

28 pts 8. Solve the following inequalities.

(a) $2x + 1 \geq 3x - 2$

(b) $x^2 - 2x < 8$

(c) $\dfrac{x+2}{x-1} \leq 0$

(d) $|2x - 1| \leq 2$

7 pts 9. Find the distance between the points $(6, -2)$ and $(2, 4)$.

5 pts 10. Find the midpoint of the line segment between the points $(6, -2)$ and $(2, 4)$.

14 pts 11. Find an equation of the line

(a) through the points $(2, 3)$ and $(-1, 2)$;

(b) through the point $(1, -3)$ and perpendicular to the line with equation $y = 2x - 3$.

7 pts 12. Determine (stating your reasons) whether the graph of the equation

$$x^2 + 2xy = 4y^2$$

is symmetric with respect to the x-axis, whether it is symmetric with respect to the y axis, and whether it is symmetric with respect to the origin.

7 pts 13. Find the center and radius of the circle with equation

$$x^2 + y^2 - 6x + 4y - 3 = 0\,.$$

5 pts 14. The amount of stretching x of a spring varies directly with the amount of force F applied. If a force of 3 Newtons stretches a spring 2 centimeters, find the force needed to stretch the spring 3 centimeters.

5 pts 15. Given that

$f(1)$	$=$	4	$g(1)$	$=$	3
$f(2)$	$=$	2	$g(2)$	$=$	-1
$f(3)$	$=$	7	$g(3)$	$=$	5
$f(4)$	$=$	-2	$g(4)$	$=$	1

find $(f \circ g)(1)$.

10 pts 16. Given that $f(x) = \dfrac{2x^2 - 1}{x + 1}$:

(a) Find $f(x + 1)$.

(b) What is the domain of f?

5 pts 17. A rectangle is to be twice as long as it is wide. Write the area A of the rectangle as a function of the width w.

7 pts 18. Sketch the graph of the function $f(x) = \begin{cases} x & \text{if } x < 1 \\ 2 - x & \text{if } x \geq 1\,. \end{cases}$

10 pts 19. Let $f(x) = x^2 - 4x + 1$. Find the vertex and axis of symmetry and sketch the graph of f.

10 pts 20. Let $f(x) = \dfrac{2x^2 - 1}{x - 1}$. Find all vertical asymptotes, horizontal asymptotes, and oblique asymptotes of the graph of f.