

1. (12pts) Simplify and write the answer so all exponents are positive:

a) $(2x^2y^{-4})^5(4x^{-3}y^{-7})^3 =$

b) $\frac{(6u^3v^{-5})^2}{(9u^2v^{-4})^3} =$

2. (4pts) Convert to scientific notation or a decimal number:

$3.32906 \times 10^5 =$

$0.00002387 =$

3. (8pts) Simplify and write in standard form:

a) $x^2(7x + 1) - (x - 4)(2x + 5) =$

b) $(3x + 5)(x^2 - 7x - 4) =$

4. (15pts) Use formulas to expand:

a) $(2x - 7)(2x + 7) =$

b) $(3x + 5y)^2 =$

c) $(5x - 2)^3 =$

5. (15pts) Factor the following. Use either a known formula or a factoring method.

a) $x^2 - 10x - 24 =$

b) $6x^2 - 29x - 5 =$

c) $64v^3 + 8 =$

6. (6pts) Write the following sets in interval notation. Then graph the interval.

$\{x \mid 4 \leq x < 13\}$

$\{x \mid x \geq -5\}$

$\{x \mid x < 3\}$

College Algebra — Joysheet 2
MAT 140, Fall 2012 — D. Ivanišić

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Show all your work!

Solve the equations.

1. (3pts) $9 + 2(1 - x) = 7 + 2(x - 1)$

2. (6pts) $x^2 - 2x = x + 28$

3. (5pts) Solve the equation for r :

$$A = P(1 + rt)$$

Simplify.

4. (8pts) $\frac{3x + 7}{2x^2 + 9x - 5} - \frac{2x + 1}{x^2 + x - 20} =$

5. (8pts) $\frac{3 + \frac{4x + 7}{x^2 - 9}}{x - \frac{10}{x + 3}} =$

Simplify, showing intermediate steps.

6. (2pts) $\sqrt{96} =$

7. (4pts) $\sqrt{216x^3y^4} =$

8. (5pts) $\sqrt[3]{50x^5y}\sqrt[3]{10x^2y^2} =$

9. (8pts) Simplify. Express answers first in terms of positive exponents, then convert to root notation.

$$\left(32x^{\frac{1}{2}}y^{\frac{5}{4}}\right)^{\frac{2}{5}} 7x^{\frac{4}{15}} \left(8y^{\frac{7}{2}}\right)^{-\frac{5}{3}} =$$

10. (5pts) Simplify.

$$(\sqrt{7} + 3\sqrt{2})(\sqrt{2} - 5\sqrt{7}) =$$

11. (6pts) Rationalize the denominator.

$$\frac{\sqrt{7} - 1}{2 + \sqrt{6}}$$

5. (10pts) Dougie's Apparel buys a cargo van for \$21,000. It expects the van to last 7 years, at which time they expect to be able to sell it for \$5600. For tax purposes, they need to know the estimated value $V(t)$ in every year of operation.

a) Write a formula for $V(t)$, assuming that it is a linear function (that is, the value decreases by the same amount every year).

b) What is the estimated value of the van after 5 years?

6. (20pts) A grocery store manager experiments weekly with prices of a 9oz bag of kettle-cooked potato chips in order to model the relationship between price and sales. The table shows the data, where P is the price of a bag, and S is the number of bags sold in a week.

a) Draw the scatterplot of the data. Does the relationship look linear?

b) Use two points in the scatterplot to get an equation of a line that models the relationship between P and S . Draw the line on the graph.

c) Use your calculator to find the "line of best fit" for the data. Draw the line on the graph.

d) Find the coefficient of correlation r . How strong is the linear relationship between P and S ?

e) What sales does the manager expect if the price is set at \$2.29?

P	S
1.89	250
1.95	231
2.05	222
2.19	198
2.39	175
2.59	152

Solve the inequalities. Write your solution in interval notation.

1. (6pts) $4 \leq 3x - 1 < 21$

2. (7pts) $2x - 1 < 3$ or $2x + 3 \geq 10$

3. (5pts) Find the domain of the function $f(x) = \frac{7 - x}{\sqrt{5x - 3}}$ (in interval notation).

4. (14pts) You inherit \$20,000 and can invest it in two different investments, one paying 3% simple interest, and the other paying 4% simple interest. If you wish to have 20,500 after 10 months, what is the least amount you must invest at 4%?

5. (14pts) In 2 hours and 40 minutes. Meryl rows her kayak upstream to a point on a river. Then she rows downstream to the starting point in 2 hours. If the river flows at 2mph, what is Meryl's rowing speed in still water?

6. (14pts) How many liters of a 12% solution of hydrochloric acid must be mixed with 2 liters of a 20% solution of hydrochloric acid in order to get a 15% solution?

1. (10pts) Use your calculator to accurately sketch the graph of the function $f(x) = x^4 - 5x^3 + 7x^2 - 2x + 6$. Draw the graph here, and indicate units on the axes.
- a) Find the local maxima and minima for this function.
- b) State the intervals where the function is increasing and where it is decreasing.

2. (20pts) Let $f(x) = \sqrt{x-3}$, $g(x) = \frac{2x+1}{3x-16}$. Find the following (simplify where possible):

$$(f+g)(2) =$$

$$(fg)(7) =$$

$$\frac{f}{g}(x) =$$

$$(f \circ g)(7) =$$

$$(g \circ f)(x) =$$

State the domain of $(fg)(x)$

3. (8pts) Consider the function $h(x) = \sqrt{3 + 2x}$. Find functions f and g so that $h(x) = f(g(x))$. Find two different solutions to this problem, neither of which is the “stupid” one.

4. (8pts) Sketch the graph of the piecewise-defined function:

$$f(x) = \begin{cases} 3x - 2, & \text{if } -1 < x < 2 \\ 2x - 3, & \text{if } x \geq 2. \end{cases}$$

5. (14pts) Farmer Charles has 1500 meters of fencing. He would like to enclose a rectangular plot of land and divide it in three parts with fences parallel to one side of the rectangle.

a) Express the area of the enclosure as a function of the length of one of the sides x . What is the domain of this function?

b) Graph the function in order to find the maximum. What are the dimensions of the enclosure that has the greatest area?

1. (4pts) Find the points symmetric to point $(-3, 4)$ with respect to:

x -axis

y -axis

the origin.

Draw a picture.

2. (12pts) Check algebraically whether the graph of $y^2 - 3x = 5$ is symmetric with respect to the x -axis, y -axis, or the origin. Then use the calculator to draw the graph and verify your conclusions.

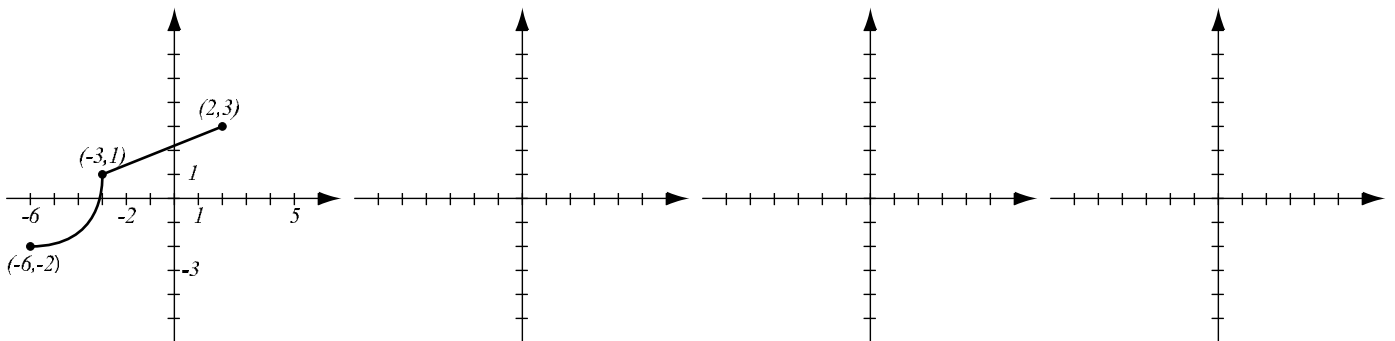
3. (14pts) For the following functions, determine algebraically whether they odd, even, or neither. Then use the calculator to draw their graphs and verify your conclusions.

$$f(x) = 2x^3 - x$$

$$g(x) = x^2 + |x| + 7$$

4. (16pts) Using transformations, draw the graphs of $f(x) = 2|x-3|$ and $g(x) = 4 - \sqrt[3]{x-5}$. Explain how you transform graphs of basic functions in order to get the graphs of f and g .

5. (14pts) The graph of $f(x)$ is drawn below. On three separate graphs, sketch the graphs of the functions $f(x) - 1$, $f(3x)$ and $2f(-x)$ and label all the relevant points.



College Algebra — Joysheet 7
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Name: _____
Show all your work!

Simplify, so that the answer is in form $a + bi$.

1. (4pts) $(7 - i)(4 + 5i) =$

2. (6pts) $\frac{2 + 3i}{1 - 8i} =$

3. (4pts) Simplify and justify your answer.

$i^{131} =$

Solve the equations:

4. (6pts) $4x^2 + 4x = 3x + 14$

5. (8pts) $3x^4 - 22x^2 - 45 = 0$

6. (6pts) Solve by completing the square.

$x^2 - 12x = 8$

7. (12pts) The quadratic function $f(x) = x^2 - 6x + 13$ is given. Do the following without using the calculator.

- a) Find the x -intercepts of its graph, if any. Find the y -intercept.
- b) Find the vertex of the graph.
- c) Sketch the graph of the function.

8. (14pts) Ella mows a rectangular yard of size 43×35 yards. She finds that her 1505 square yards are too much work to mow, so she decides to decrease the size of the mowing area by reducing the length and width by the same amount. If her target yard area is 900 square yards, by how much should she reduce the length and width of her current yard?

College Algebra — Joysheet 8
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Name: _____
Show all your work!

1. (4pts) Solve the equation.

$$|2x + 4| = 15$$

2. (12pts) Solve the inequalities. Draw your solution and write it in interval form.

$$|x + 5| \leq 9$$

$$|2x - 3| \geq 7$$

Solve the equations:

3. (8pts) $\frac{x}{x-1} - \frac{2x+30}{x^2+2x-3} = \frac{6}{x+3}$

4. (8pts) $\sqrt{4x+5} + \sqrt{x+5} = 3$

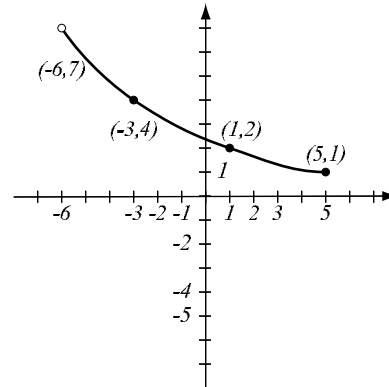
5. (14pts) A model rocket is launched with initial velocity 80 ft/sec from a height of 100ft. The height of the rocket in feet t seconds after launch is given by $s(t) = -16t^2 + 80t + 100$.

- a) When does the rocket reach its greatest height, and what is that height?
- b) When does the rocket return to ground?

6. (14pts) Farmer Frank has 1000 meters of fencing. He would like to enclose a rectangular plot of land next to a river so that its area is the largest possible. The side of the rectangle that goes along the river does not require a fence.

- a) Express the area of the enclosure as a function of the length of one of the sides. What is the domain of this function?
- b) Sketch the graph the function in order to find the maximum (no need for the graphing calculator — you should already know what the graph looks like). What are the dimensions of the enclosure that has the greatest area?

1. (6pts) The graph of a function f is given.
- Is this function one-to-one? Justify.
 - If the function is one-to-one, find the graph of f^{-1} , labeling the relevant points.



2. (12pts) Let $g(x) = \frac{3x + 4}{4x + 5}$. Find the formula for g^{-1} . Find the domain and range of g .

3. (8pts) Evaluate without using the calculator:

$$\log_3 729 =$$

$$\log_5 \frac{1}{125} =$$

$$\log_{16} 2 =$$

$$\log_c \sqrt[5]{c^2} =$$

4. (4pts) Use your calculator to find $\log_7 78$ with accuracy 6 decimal places. Show how you obtained your number.

5. (6pts) If you invest \$20,000 in an account bearing 4.25%, compounded quarterly, how much is in the account in 5 years?

6. (3pts) Find the domain of $f(x) = \log_{17}(7 - 2x)$.

7. (7pts) The number of master's degrees (in thousands) earned by women is modeled by the function $D(t) = 43.1224(1.0475)^t$, where t is the number of years since 1960.

a) Find the number of master's degrees earned by women in 2004. How many master's degrees will be earned in 2020, according to the model?

b) Use the intersect feature on the calculator to estimate in what year the number of master's degrees will surpass 200,000.

8. (14pts) Using transformations, draw the graphs of $f(x) = 4 \cdot 3^{x-5}$ and $g(x) = 2 - \log(x+3)$. Explain how you transform graphs of basic functions in order to get the graphs of f and g .

1. (5pts) If $\log_a 4 = 0.489301$ and $\log_a 5 = 0.568061$, find (show how you obtained your numbers):

$$\log_a 20 =$$

$$\log_a \frac{16}{5} =$$

2. (11pts) Write as a sum and/or difference of logarithms. Express powers as factors. Simplify if possible.

$$\log_3 (81x^4y^2) =$$

$$\log_5 \sqrt[5]{\frac{x^3y^{-7}}{25y^3}} =$$

3. (12pts) Write as a single logarithm. Simplify if possible.

$$\frac{1}{3} \ln(125x^{\frac{1}{2}}) + \frac{1}{2} \ln(625y^7) - \ln(x^{\frac{2}{3}}) =$$

$$2 \log_a(x + 6) - 4 \log_a(x^2 - 36) - 3 \log_a(x - 6) =$$

Solve the equations.

4. (5pts) $7^{2-x} = 49^{3x-1}$

5. (7pts) $4^{x+9} = 9^{2x+4}$

6. (8pts) $\log_2(x+1) + \log_2(x+5) = 5$

7. (12pts) The 2000 and 2010 censuses recorded Murray as having 14,950 and 17,741 people, respectively. Assume Murray's population grows exponentially.

a) Write the function describing the number $P(t)$ of people t years after 2000. Then find the exponential growth rate of Murray's population.

b) Graph the function.

c) According to this model, when will the population reach 20,000?