1. (4pts) Write two examples of each kind of number:

natural   integer   rational   irrational

2. (12pts) Simplify:

a) $3 - \left(4 \cdot 2 + 4 \cdot \dfrac{2}{3}\right) =$

b) $\dfrac{3}{20} - \dfrac{7}{15} =$

c) $\dfrac{\dfrac{3}{14}}{\dfrac{18}{7}} =$

d) $(-4)^3 =$

e) $-2^{-4} =$

f) $\sqrt{(-5)^2} =$

3. (2pts) Draw the numbers -5 an 4 on the number line and find the distance between them.

4. (8pts) Simplify and write the answer so all exponents are positive:

a) $\dfrac{(2x)^2(x^3y)^4}{x^5(4y)^3} =$

b) $\dfrac{3x^{-3}(5y)^2}{(5x^{-2}y^3)^4} =$

5. (2pts) Convert to scientific notation:

$34745 =$ $\qquad\qquad\qquad$ $0.000000893 =$

6. (2pts) Convert to a decimal number:

$3.486 \times 10^7 =$ $\qquad\qquad\qquad$ $2.5417 \times 10^{-3} =$

1. (6pts) Simplify:

a) $(3x - 1)(-2x + 5) =$

b) $(x + 6)(x - 6) - 4x(3x - 5) =$

c) $(x^2 + 3x - 5)(4x - 1) =$

2. (3pts) Verify the formula for the cube of a sum by multiplying out the factors:

$(x + a)^3 = (x + a)^2(x + a) =$

3. (5pts) Use formulas to expand:

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

b) $(2x + 4)^3 =$

4. (8pts) Factor the following. Use either a known formula or a factoring method.

a) $x^2 - 2x - 35 =$

b) $6x^2 - 7x - 10 =$

c) $x^3 + 125 =$

5. (8pts) Simplify.

a) $\dfrac{x+1}{x^2 - 64} + \dfrac{2x - 3}{x^2 + 7x - 8} =$

b) $\dfrac{1 - \dfrac{3x}{x^2 - 4}}{\dfrac{x+1}{x+2}} =$

1. (6pts) Let $A = (2, -3)$, $B = (7, 2)$, $C = (1, 1)$.
a) Find the distance between A and the midpoint of B and C.
b) Is the triangle ABC a right triangle?

2. (6pts) Use your calculator to sketch the graph of $y = x^4 - 3x^3 + 5x - 17$. Make sure all the features of the graph are visible and indicate your viewing window. Find the all the x-intercepts and the y-intercept to two decimal places.

3. (8pts) Solve the following equations for x:

a) $c^2x - c = d + d^2x$

b) $\dfrac{a + bx}{b + ax} = 2b - a$

4. (5pts) On three exams, Bill has scores of 89, 81 and 73. What is the minimal score he needs on exam 4 so that the average of the exams is at least 84?

5. (5pts) Sheryl is paid 25% extra for hours worked in excess of 36 hours. If she worked 46 hours and earned $457.84, what is her hourly wage?

1. (15pts) Solve the following quadratic equations:

$2x^2 - 39 = 11$ $\qquad\qquad\qquad\qquad\qquad\qquad$ $x^2 + 2x = 24$

$18x^2 - x = 8x + 2$ $\qquad\qquad\qquad\qquad\qquad$ $2x^2 - 8x = x^2 + 6x - 3$

2. (8pts) Solve the following equations:

$$|3x - 1| = 7 \qquad\qquad x + 2 = \sqrt{5x + 24}$$

3. (7pts) You have a rectangular plot of length 7 feet and width 4 feet and would like to enlarge it so its area is 35 square feet. To this end, you increase the length by x feet and increase the width by $2x$ feet. By how much did you need to increase the length and width of the rectangle to achieve the desired area?

1. (10pts) Solve the following inequalities and:
a) shade the solution on the number line
b) write the solution in interval notation

$2 \leq 3 - 2x < 7$ $|x + 5| \geq 4$

2. (5pts) Use your calculator to solve the inequality $x^2 - 5x \leq 17$. Sketch the appropriate graph here, shade your solution on the number line and write it in interval notation.

3. (5pts) Let $A = (2, -3)$, $B = (7, 2)$, $C = (1, 1)$. Without using the Pythagorean theorem, determine whether the triangle ABC is a right triangle. (Hint: check for perpendicular lines.)

4. (5pts) The line $3x + 2y = 5$ is given.
a) Find the equation of the line that passes through $(3, 2)$ and is parallel to the given line.
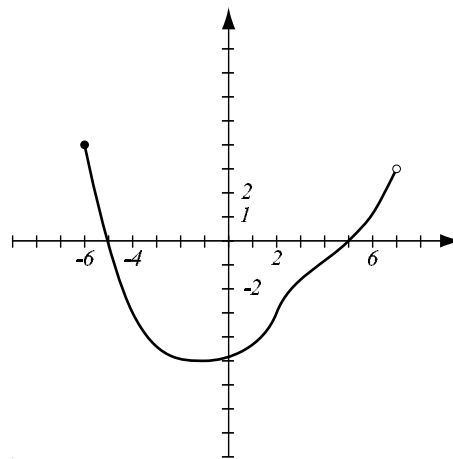b) Sketch the picture.

5. (5pts) Find the equation of the circle whose diameter is the line segment connecting $(-1, 3)$ and $(5, -3)$. Draw the picture.

1. (6pts) Let f be given by $f(x) = \dfrac{3x - 5}{x^2 + 3x}$. Find the $f(3)$, $f(-x)$, $f(x+2)$ and (Simplify where possible).

2. (4pts) Find the domain of $f(x) = \dfrac{x + 1}{x + 2x - 15}$.

3. (10pts) Use the graph of the function f at right to answer the following questions.

a) What is the domain of f?

b) What is the range of f?

c) Find $f(-4)$ and $f(2)$.

d) List the x-intercepts of the graph.

e) Where is the function decreasing?

f) What are the solutions of the equation $f(x) = 2$?

g) For which x is $f(x) > 0$?

4. (10pts) The function $f(x) = x^3 - 7x$ is given.

a) Determine algebraically whether this function is even, odd or neither.

b) Sketch the graph of f on paper. Why does your picture support what you found in a)?

c) List the numbers where f has a local maximum. What are the local maxima (i.e. the y-values)? Accuracy: 2 decimal points.

d) List the intervals where f is increasing or decreasing.

1. (6pts) Suppose a cab company charges $2.50 per ride plus 55 cents for every mile traveled.
a) Write the linear function that expresses the cost of a ride as a function of miles traveled.
b) What is the cost of a ride that takes you 13 miles?
c) What is the farthest you can reach with $20 in your pocket?

2. (6pts) In an effort to relate a child's height H to their head circumference C, a pediatrician has measured nine children.
a) Draw the scatterplot of the data on paper. Does the relationship look linear?
b) Use the calculator to find the "line of best fit" to the data. Draw the line on paper.
c) What does the equation from b) predict about the head circumference of a child whose height is 26in?

H	C
25.25	16.4
25.75	16.9
25	16.9
27.75	17.6
26.5	17.3
27	17.5
26.75	17.3
26.75	17.5
27.5	17.5

3. (4pts) Use the basic graph of $y = \sqrt{x}$ and transformations to help you sketch the graph of $y = 2\sqrt{x} + 3$. Explain how you transform the original graph.

4. (8pts) The graph of the function f is given below. On three separate graphs, sketch the graphs of the functions $f(x - 1)$, $\frac{1}{2}f(x)$ and $f(-x) + 3$. Label all the relevant points.
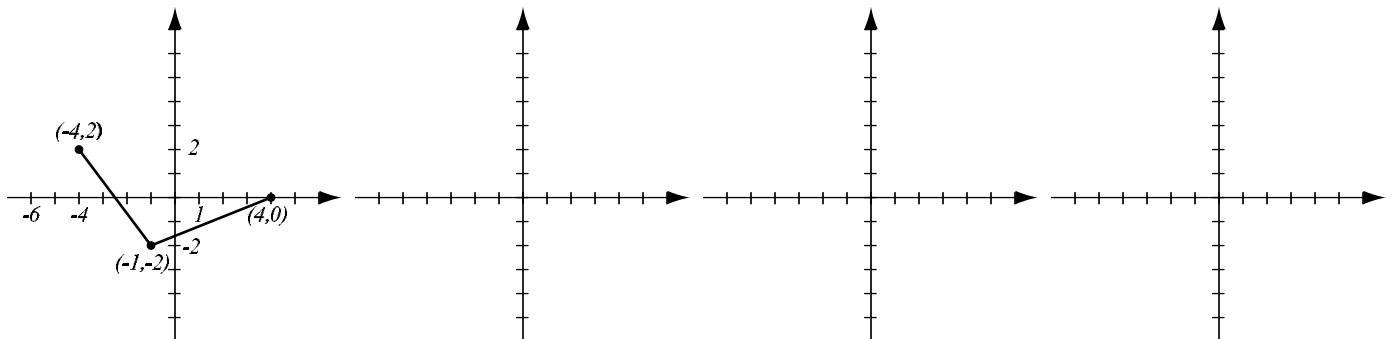
5. (6pts) The function f is given below.
a) Sketch the graph of f.
b) Find the domain and range of f.

$$f(x) = \begin{cases} -3x + 2, & \text{if } -5 \leq x < 2 \\ -x + 7, & \text{if } 2 \leq x < 6. \end{cases}$$

1. (8pts) Anna has 4000ft of fencing with which she plans to enclose a rectangular field and divide it into two parts by running some of the fence across the field, parallel to the width side (picture).
a) Express the area A of the rectangle as a function of the width x of the rectangle.
b) Draw an accurate graph of the function $A(x)$.
c) For what x is the area the largest? What is the maximum area?

2. (11pts) Consider the polynomial $P(x) = (x+2)(x+4)(x-5)^2$. Answer the following (decimal answers should have accuracy to two decimal places).
a) Find the x-intercepts of the graph and the y-intercept.
b) P behaves like what function for large $|x|$?
c) Find the turning points of P.
d) Sketch the graph of the function on paper. Make sure scale is marked and all features you found in a)-c) are indicated.
e) Use the graph to determine the range of the function.

3. (11pts) Consider the rational function $Q(x) = \dfrac{2x^2 - 5}{x^2 - x - 12}$. Answer the following (decimal answers should have accuracy to two decimal places).

a) Find the domain of the function and where the vertical asymptotes are.

b) Find the x-intercepts of the graph and the y-intercept.

c) Find the horizontal asymptote, if any.

d) Sketch the graph of the function on paper. Make sure scale is marked and all features you found in a)-c) are indicated.

e) Find the intervals where the function is decreasing.

1. (5pts) The table gives values of f and g for some x's. Find the following:

$$f^{-1}(3) =$$

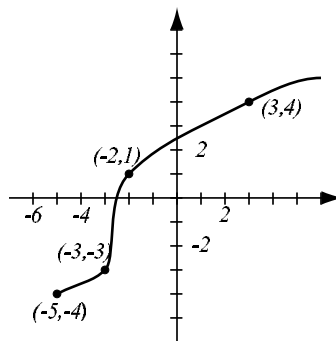| x	1	2	3	4
$f(x)$	1	3	4	2
$g(x)$	4	3	1	2

$$g^{-1}(2) =$$

$$(f \circ g^{-1})(1) =$$

$$(g^{-1} \circ f^{-1})(3) =$$

2. (4pts) The graph of a function f is given. Use it to find the graph of f^{-1}, labeling the relevant points.

3. (5pts) Let $f(x) = \dfrac{4x}{3x-2}$.

a) Find $f^{-1}(x)$.

b) Find the domain and range of f^{-1}.

4. (4pts) Use the basic graph of $y = e^x$ and transformations to help you sketch the graph of $y = e^{x+1} - 2$. Explain how you transform the original graph. Find all the asymptotes of $y = e^{x+1} - 2$.

5. (4pts) The atmospheric pressure at a point h kilometers above sea level is given by $P(h) = 760e^{-0.145h}$ (pressure is measured in millimeters of mercury).
a) What is the pressure at height 4km?
b) At what height is pressure 700? (Use graphing on your calculator to find the solution of the appropriate equation).

6. (8pts) Solve the equations:

$5^{x^2+4x-19} = 25$ $\qquad\qquad\qquad\qquad\qquad\qquad\qquad 2^{3x+7} = 16^{2x+1}$

1. (4pts) Evaluate without using the calculator:

$\log_3 81 =$ $\log_7 \frac{1}{49} =$ $\log_5 \sqrt[8]{5^3} =$ $\log_a \sqrt[3]{a} =$

2. (7pts) Solve the equations:

$\log_4 x = 5$ $\ln x = 7$

$10^{3x-1} = 32$ $\log_2(2x + 8) = 5$

3. (4pts) If A represents the area of a wound, then normal healing of a wound that is 120mm^2 in size is represented by $A = 120e^{-0.35t}$, where t is the number of days following the injury. How long is it before the wound is 1/3 of the original size?

4. (5pts) Write as a sum and/or difference of logarithms. Express powers as factors. Simplify if possible.

$$\log_3 \frac{x^7}{\sqrt{x-1}} =$$

$$\ln(e^x(e^x - 4)^5) =$$

5. (6pts) Write each the following as a single logarithm. Simplify if possible.

$$\frac{1}{3}\log v^6 + 2\log v^2 =$$

$$\ln(x^2 - x + 2) - 2\ln(x + 1) =$$

6. (4pts) Solve the equation:

$$3^{x+1} = 7^{2x-3}$$