



**St. Louis Community
College**
Meramec

MATH REVIEW SUPPLEMENT

For The

COLLEGE ALGEBRA SECTION

Of the

ACCUPLACER Entry Assessment

Visit The Assessment Center At
<http://www.stlcc.cc.mo.us/mc/services/assess/index.html>

College Level Math Study Guide for the Accuplacer (CPT)

The following sample questions are similar to the format and content of questions on the Accuplacer College Level Math test. Reviewing these samples will give you a good idea of how the test works and just what mathematical topics you may wish to review before taking the test itself. Our purposes in providing you with this information are to aid your memory and to help you do your best.

I. Solving Equations

A. Exponential

1. $10^x = 1000$

2. $10^{3x+5} = 100$

3. $2^{x+1} = \frac{1}{8}$

4. $3^{x^2}(9^x) = \frac{1}{3}$

5. $2^{x^2}(4^{2x}) = \frac{1}{8}$

B. Logarithmic

1. $\log_2(x+5) = \log_2(1-5x)$

2. $2\log_3(x+1) = \log_3(4x)$

3. $\log_2(x+1) + \log_2(x-1) = 3$

4. $\ln x + \ln(2x+1) = 0$

5. $\ln x + \ln(x+2) = \ln 3$

6. $3^{2x} = 4^{x+1}$

II. Solving Inequalities

Solve the following inequalities and express the answer graphically and using interval notation.

A. Quadratic or Rational

1. $3x^2 - 11x - 4 < 0$

2. $6x^2 + 5x \geq 4$

3. $\frac{x+2}{3-x} \geq 0$

4. $\frac{(x+1)(x-3)}{2x+7} \leq 0$

III. Graphing Relations, Domain & Range

For each relation, state if it is a function, state the domain & range, and graph it.

1. $y = \sqrt{x+2}$

2. $y = \sqrt{x} - 2$

3. $y = \frac{x-1}{x+2}$

6. $x = y^2 + 2$

7. $y = x^2 + 8x - 6$

8. $y = \sqrt{-x}$

4. $f(x) = -|x+1| + 3$

9. $y = 3^x$

5. $f(x) = \frac{2x-5}{x^2-9}$

10. $h(x) = \frac{6x^2}{3x^2-2x-1}$

IV. Exponential Functions and Logarithms

1. Graph: $f(x) = 3^x + 1$

6. Solve: $\log_x 9 = 2$

2. Graph: $g(x) = 2^{x-1}$

7. Graph: $h(x) = \log_3 x$

3. Express $8^{-2} = \frac{1}{64}$ in logarithmic form.

8. Use the properties of logarithms to

4. Express $\log_5 25 = 2$ in exponential form.

expand as much as possible: $\log_4 \frac{3}{y}$

5. Solve: $\log_2 x = 4$

9. How long will it take \$850 to be worth \$1,000 if it is invested at 12% interest compounded quarterly?

V. Systems of Equations & Matrices

1.
$$\begin{aligned} x + 2y + 2z &= 3 \\ 2x + 3y + 6z &= 2 \\ -x + y + z &= 0 \end{aligned}$$

3. Multiply:
$$\begin{bmatrix} 1 & -1 & 1 \\ 0 & 2 & 0 \\ -2 & 1 & -3 \end{bmatrix} \begin{bmatrix} 0 & 2 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

2. Perform the indicated operation:

4. Find the determinant:
$$\begin{vmatrix} 1 & -2 \\ 3 & -1 \end{vmatrix}$$

$$-2 \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} + 3 \begin{bmatrix} 1 & -2 \\ 3 & 6 \end{bmatrix}$$

5. Find the Inverse:
$$\begin{bmatrix} 1 & 2 \\ -1 & 2 \end{bmatrix}$$

VI. Conic Sections

- Graph the following, and find the center, foci and asymptotes if possible.
 - $(x-2)^2 + y^2 = 16$
 - $\frac{(x+1)^2}{16} + \frac{(y-2)^2}{9} = 1$
 - $\frac{(x+1)^2}{16} - \frac{(y-2)^2}{9} = 1$
 - $(x-2)^2 + y = 4$
- Identify the conic section and put into standard form.
 - $x^2 - 4x - 12 + y^2 = 0$
 - $9x^2 + 18x + 16y^2 - 64y = 71$
 - $9x^2 + 18x - 16y^2 + 64y = 199$
 - $x^2 + y - 4x = 0$

VII. Sequence & Series

- Write out the first four terms of the sequence whose general term is $a_n = 3n - 2$.
- Write out the first four terms of the sequence whose general term is $a_n = n^2 - 1$.
- Write out the first four terms of the sequence whose general term is $a_n = 2^n + 1$.
- Find the general term for the following sequence: 2,5,8,11,14,17.....
- Find the general term for the following sequence: 4,2,1, $\frac{1}{2}$, $\frac{1}{4}$

- Find the sum: $\sum_{k=0}^6 2k - 1$
- Expand the following: $\sum_{k=0}^4 \binom{4}{k} x^k y^{4-k}$

VIII. Functions

Let $f(x) = 2x + 9$ and $g(x) = 16 - x^2$. Find the following.

- $(g \circ f)(-2)$
- $f(g(x))$
- $f^{-1}(2)$
- $f(f^{-1}(3))$

XIV. Fundamental Counting Rule, Factorials, Permutations, & Combinations

1. Evaluate: $\frac{8!}{3!(8-3)!}$
2. A particular new car model is available with five choices of color, three choices of transmission, four types of interior, and two types of engines. How many different variations of this model car are possible?
3. In a horse race, how many different finishes among the first three places are possible for a ten-horse race?
4. How many ways can a three-person subcommittee be selected from a committee of seven people? How many ways can a president, vice president, and secretary be chosen from a committee of seven people.

Answers

I. Solving Equations

A. Exponential

1. $10^x = 1000$
 $10^x = 10^3$
 $\therefore x = 3$

2. $x = -1$
3. $x = -4$
4. $x = -1, -1$
5. $x = -1, -3$

B. Logarithms

1. $\log_2(x+5) = \log_2(1-5x)$
 $x+5 = 1-5x$
 $6x = -4$
 $x = -\frac{2}{3}$

2. $2\log_3(x+1) = \log_3(4x)$
 $\log_3(x+1)^2 = \log_3(4x)$
 $(x+1)^2 = 4x$
 $x^2 - 2x + 1 = 0$
 $x = 1, 1$

3. $x = 3$ is the only solution since -3 causes the argument of the logarithm to be negative.
4. $x = \frac{1}{2}$ is the only solution since -1 causes the argument of a logarithm to be negative.
5. $x = 1$ is the only solution since -3 causes the argument of a logarithm to be negative.

6. $3^{2x} = 4^{x+1}$
 $2x \ln 3 = (x+1) \ln 4$
 $2x \ln 3 - x \ln 4 = \ln 4$
 $x(2 \ln 3 - \ln 4) = \ln 4$
 $x = \frac{\ln 4}{2 \ln 3 - \ln 4}$

Some properties you will need to be familiar

If $a^r = a^s$, then $r = s$.

If $a^r = b^r$, then $a = b$.

Properties of logarithms to be familiar with.

If $\log_b M = \log_b N$, then $M = N$.

If $\log_b x = y$, then this equation can be rewritten in exponential as $b^y = x$.

$$\log_b(MN) = \log_b M + \log_b N$$

$$\triangleright \log_b \left(\frac{M}{N} \right) = \log_b M - \log_b N$$

$$\triangleright \log_b M^r = r \log_b M$$

\triangleright Always check your answer!! Bases and arguments of logarithms can not be negative.

Double root.

II. Solving Inequalities

A. Quadratic or Rational

1. $3x^2 - 11x - 4 < 0$

Zero should be on one side of the inequality while every thing else is the other side.

$$(3x+1)(x-4) < 0$$

The factors provide the values of x ($x = -\frac{1}{3}$ and $x = 4$) where the sign of the inequality may change sign.

$$\left(-\infty, -\frac{1}{3}\right), \left(-\frac{1}{3}, 4\right), (4, \infty)$$

Intervals of solution/no solution.

Test $x = -1$ in the first interval.

$x = -1$ produces a false statement, so the solution is not in the interval $\left(-\infty, -\frac{1}{3}\right)$.

$$[3(-1)+1](-1-4) < 0$$

$$10 < 0$$

Test $x = 0$ in the second interval.

$x = 0$ satisfies the inequality, so the solution is in the interval $\left(-\frac{1}{3}, 4\right)$.

$$3(0)^2 - 11(0) - 4 < 0$$

$$-4 < 0$$

Test $x = 5$ in the third interval.

$x = 5$ produces a false statement, so the solution is not in the third interval $(4, \infty)$.

$$16 < 0$$

The solution in set builder notation is $\{x \mid -\frac{1}{3} < x < 4\}$ and in interval notation is $\left(-\frac{1}{3}, 4\right)$.

2. $\left(-\infty, -\frac{4}{3}\right] \cup \left[\frac{1}{2}, \infty\right)$

3. $[-2, 3)$

4. $\left(-\infty, -\frac{7}{2}\right) \cup [-1, 3]$

For rational inequalities, the values of x that make the numerator zero or the denominator zero must be used to divide the number line into intervals or solution/no solution. We don't include $x = 3$ in #3 or $x = -7/2$ in #4 because they give division by zero.

III. Graphing Relations

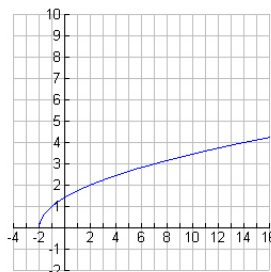
1.

$$y = \sqrt{x+2}$$

$$\text{Domain : } [-2, \infty)$$

$$\text{Range : } [0, \infty)$$

Function.



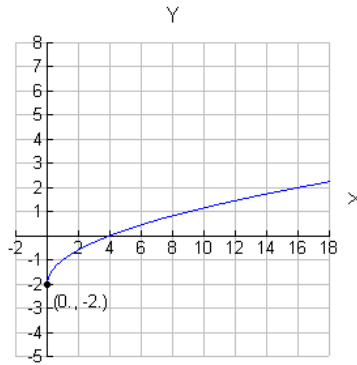
2.

$$y = \sqrt{x} - 2$$

Domain : $[0, \infty)$

Range : $[-2, \infty)$

Function



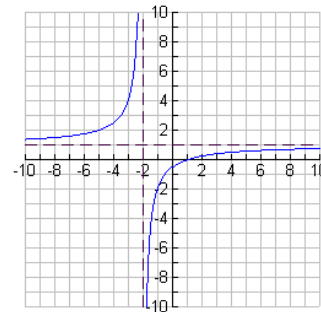
3.

$$y = \frac{x-1}{x+2}$$

Domain : All Real Numbers except -2

Range : $(-\infty, 1) \cup (1, \infty)$

Function



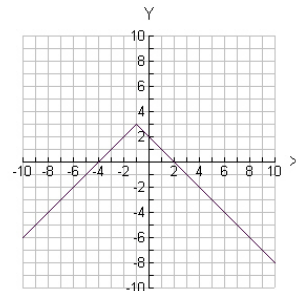
4.

$$f(x) = -|x+1| + 3$$

Domain : $(-\infty, \infty)$

Range : $(-\infty, 3]$

Function



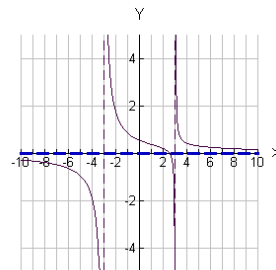
5.

$$f(x) = \frac{2x-5}{x^2-9}$$

Domain : All Real Numbers except ± 3

Range : All Real Numbers.

Function



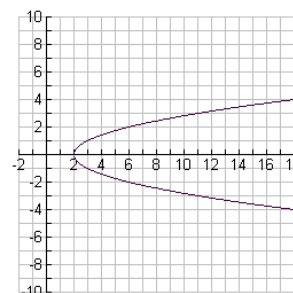
6.

$$x = y^2 + 2$$

Domain : $[2, \infty)$

Range : $(-\infty, \infty)$

Not a function



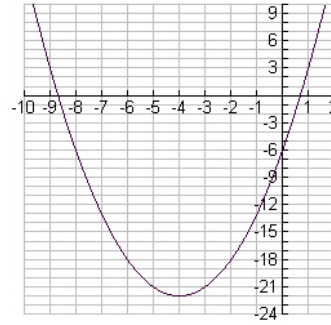
7.

$$y = x^2 + 8x - 6$$

$$\text{Domain} : (-\infty, \infty)$$

$$\text{Range} : [-22, \infty)$$

Function



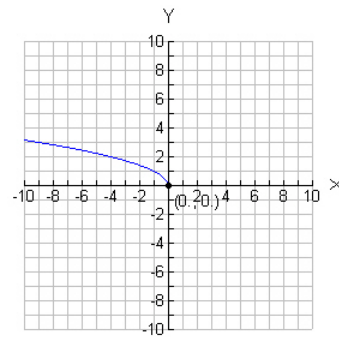
8.

$$y = \sqrt{-x}$$

$$\text{Domain} : (-\infty, 0]$$

$$\text{Range} : [0, \infty)$$

Function



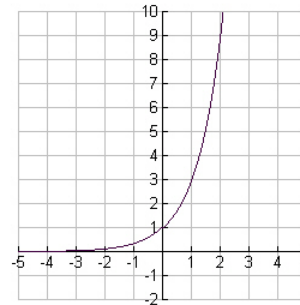
9.

$$y = 3^x$$

$$\text{Domain} : (-\infty, \infty)$$

$$\text{Range} : (0, \infty)$$

Function



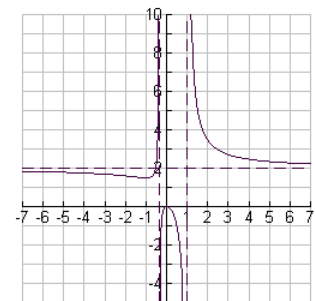
10.

$$h(x) = \frac{6x^2}{3x^2 - 2x - 1}$$

$$\text{Domain} : \text{All Real Numbers except } -\frac{1}{3}, 1$$

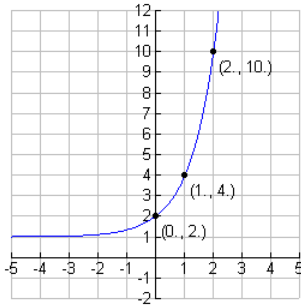
$$\text{Range} : (-\infty, 0] \cup \left[\frac{3}{2}, \infty\right)$$

Function

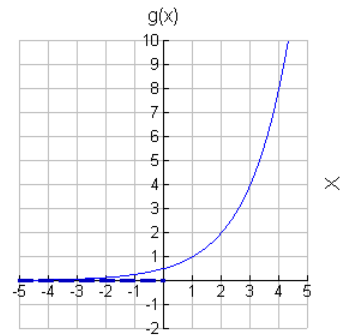


IV. Exponential and Logarithms

1. $f(x) = 3^x + 1$



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



3. $\log_8 \frac{1}{64} = -2$

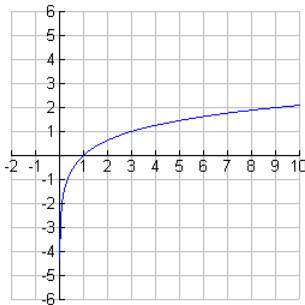
4. $5^2 = 25$

5. $\log_2 x = 4$
 $2^4 = x$
 $16 = x$

6. In exponential form:
 $b^2 = 9$
 $b = \pm 3$

7. $h(x) = \log_3 x$

$b = 3$, throw out $b = -3$,
because the base cannot be
negative.



8. $\log_4 \frac{3}{y} = \log_4 3 - \log_4 y$

9.

$$A(t) = P\left(1 + \frac{r}{n}\right)^t$$

$$1000 = 850\left(1 + \frac{0.12}{4}\right)^t$$

$$\frac{1000}{850} = 1.03^t$$

$$\ln\left(\frac{20}{17}\right) = t \ln(1.03)$$

$$t = \frac{\ln\left(\frac{20}{17}\right)}{\ln(1.03)} \approx 5.5 \text{ years}$$

Where

A = money ended

P = Principle

r = yearly interest rate

n = number of compounded per year

t = number of years

V. Systems of Equations & Matrices

1. $\{(1, 2, -1)\}$

2. $\begin{bmatrix} -5 & -8 \\ 5 & 14 \end{bmatrix}$

3. $\begin{bmatrix} -1 & 0 & 2 \\ 2 & 4 & 0 \\ 1 & -2 & -5 \end{bmatrix}$

4. 5

5. $\begin{bmatrix} \frac{1}{2} & -\frac{1}{2} \\ \frac{1}{4} & \frac{1}{4} \end{bmatrix}$

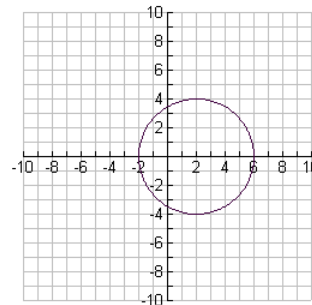
VI. Conic Sections

For an explanation of the theory behind the following problems, see chapter 7 of the college Algebra text.

1. a) $(x-2)^2 + y^2 = 16$

Center : $(2, 0)$

Radius : 4

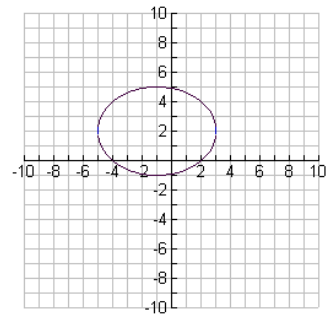


1. b)

$$\frac{(x+1)^2}{16} + \frac{(y-2)^2}{9} = 1$$

Center : $(-1, 2)$

Foci : $(-1 \pm \sqrt{7}, 2)$



c)

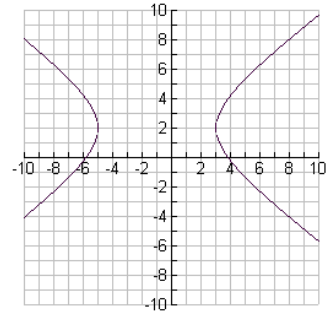
$$\frac{(x+1)^2}{16} - \frac{(y-2)^2}{9} = 1$$

Center : $(-1, 2)$

Foci : $(-6, 2), (4, 2)$

Asymptotes : $y = \frac{3}{4}x + \frac{11}{4}$

$$y = -\frac{3}{4}x + \frac{5}{4}$$



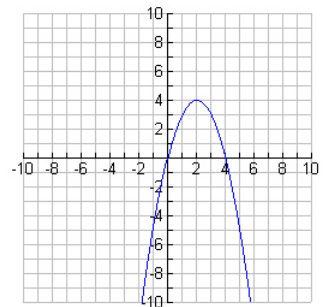
d)

$$(x-2)^2 + y = 4$$

Vertex : $(2, 4)$

Foci : $(2, \frac{15}{4})$

Directrix : $y = \frac{17}{4}$



2. a) Circle $(x-2)^2 + y^2 = 16$

b) Ellipse $\frac{(x+1)^2}{16} + \frac{(y-2)^2}{9} = 1$

c) Hyperbola $\frac{(x+1)^2}{16} - \frac{(y-2)^2}{9} = 1$

d) Parabola $(x-2)^2 = -(y-4)$

VII. Sequence & Series

1. 1,4,7,10

2. 0,3,8,15

3. 3,5,9,17

4. $a_n = 3n - 1$

5. $a_n = 4\left(\frac{1}{2}\right)^{n-1}$

6. $\sum_{k=0}^6 (2k - 1) = -1 + 1 + 3 + 5 + 7 + 9 + 11 = 35$

7. $\sum_{k=0}^4 \binom{4}{k} x^k y^{4-k} = y^4 + 4xy^3 + 6x^2y^2 + 4x^3y + x^4$

VIII. Functions

1. $(g \circ f)(-2) = g(f(-2)) = g(2 \cdot (-2) + 9) = g(5) = 16 - (5)^2 = -9$

2. $f(g(x)) = f(16 - x) = 2(16 - x^2) + 9 = 41 - 2x^2$

3. $f^{-1}(x) = \frac{x-9}{2}$; $f^{-1}(2) = \frac{2-9}{2} = -\frac{7}{2}$

4. 3

XIV. Fundamental Counting Rule, Permutations, & Combinations

1. 56

2. 120

3. 720

4. Committee 35
Elected 210