To the Student:

After your registration is complete and your proctor has been approved, you may take the Credit by Examination for Algebra 2A.

WHAT TO BRING

- several sharpened No. 2 pencils
- graphing calculator

ABOUT THE EXAM

The exam will consist of 40 questions, most of which require you to show your work. The exam is based on the Texas Essential Knowledge and Skills (TEKS) for this subject. The full list of TEKS is included in this document (it is also available online at the Texas Education Agency website, [http://www.tea.state.tx.us/](http://www.tea.state.tx.us/)). The TEKS outline specific topics covered in the exam, as well as more general areas of knowledge and levels of critical thinking. Use the TEKS to focus your study in preparation for the exam.

The examination will take place under supervision, and the recommended time limit is three hours. You may not use any notes or books. A percentage score from the examination will be reported to the official at your school.

In preparation for the examination, review the TEKS for this subject. All TEKS are assessed. It is important to prepare adequately. Since questions are not taken from any one course, you can prepare by reviewing any of the state-adopted textbooks that are used at your school. The textbook used with our ALG 2A course is *Algebra II*, 2008 Texas edition, by Prentice Hall, Inc.

We have included a sample examination with this letter. The sample exam will give you a model of the types of questions that will be asked on your examination. It is not a duplicate of the actual examination. It is provided to illustrate the format of the exam, not to serve as a complete review sheet.

Good luck on your examination!
Preparing for the CBE

For successful completion of the CBE, you should be able to do the following:

• use properties and attributes of functions and apply functions to problem situations;

• understand the importance of the skills required to manipulate symbols in order to solve problems;

• use the necessary algebraic skills to simplify algebraic expressions and solve equations and inequalities in problem situations;

• formulate systems of equations and inequalities from problem situations, use a variety of methods to solve them, and analyze the solutions in terms of the situations;

• connect algebraic and geometric representations of functions;

• recognize the relationship between the geometric and algebraic descriptions of conic sections;

• understand that quadratic functions can be represented in different ways and translated among their various representations;

• interpret and describe the effects of changes in the parameters of quadratic functions in applied and mathematical situations;

• formulate equations and inequalities based on quadratic functions, use a variety of methods to solve them, and analyze the solutions in terms of the situation;

• formulate equations and inequalities based on square root functions, use a variety of methods to solve them, and analyze the solutions in terms of the situation;

• formulate equations and inequalities based on rational functions; use a variety of methods to solve them, and analyze the solutions in terms of the situation.

You should review these subjects to prepare yourself for the exam.
Sample CBE Questions

Answer the following questions on your own paper.

1. Simplify:  $5 - 8 (3 - 6) ÷ 2^2 + 10$
2. Simplify:  $2a (5.4 - 4b) - 4a(3.1 + 8b)$
3. Find the mean, median, and mode of the following data: 66, 67, 68, 69, 70, 73, 74, 76, 78, 78, 84
4. Solve for $a$:  $2(a - 1) = 8a - 6$
5. Solve for $x$:  $3(x - 2) = y$
6. Solve:  $|r + 14| = 23$
7. Solve and graph:  $3 - 4x ≤ 6x - 2$
8. Solve:  $-2 ≤ x - 4 < 3$
9. Solve:  $|3x + 7| ≥ 26$
10. State the following relation’s domain and range and determine if it is a function: [(-5, 6), (-2, -4), (-1, -6), (2, 6)]
11. Find $f(-3)$ if $f(x) = x^3 - 5$.
12. Graph $2x + y = 11$.
13. Write $2x - 6 = y + 8$ in standard form.
14. Determine the slope of the line that passes through (-5, 3) and (7, 9).
15. Given that the slope of a line is $\frac{3}{4}$ and passes through (-6, 9), write the equation of the line in slope-intercept form.
16. Write the slope-intercept form of a line that passes through (1, 2) and is parallel to the graph of $y = -3x + 7$.
17. Graph $x > y - 1$.
18. Solve by graphing:  
   \[
   \begin{cases}
   y + x = 3 \\
   3x - y = 1
   \end{cases}
   \]
19. Solve by substitution or elimination method: \[
\begin{align*}
  x + y &= 4 \\
  x - y &= 8.5
\end{align*}
\]

20. Solve the system: \[
\begin{align*}
  2x + y - z &= 2 \\
  x + 3y + 2z &= 1 \\
  x + y + z &= 2
\end{align*}
\]

21. Multiply: \[
\begin{array}{ccc}
  2 & -3 \\
  4 & 1 \\
  0 & 3 \\
\end{array}
\]

22. Solve: \[
\begin{array}{c}
  2x \\
  y
\end{array} = \begin{array}{c}
  32 + 6y \\
  7 - x
\end{array}
\]

23. Subtract: \[
\begin{array}{ccc}
  8 & -1 & 1 \\
  3 & 4 & 6
\end{array}
\]

24. Multiply the following: \((x^4 y^6) \times (8x^3 y)\)

25. Write 31000 in scientific notion.

26. Subtract: \((5x^2 + 4x) - (3x^2 + 6x - 7)\)

27. Divide \((4x^4 - x^3 - 19x^2 + 11x - 2)\) by \((x - 2)\).

28. Factor: \(4x^3 - 6x^2 + 10x - 15\)

29. Simplify: \(\sqrt[5]{2187x^{14}y^{35}}\)

30. Multiply: \(6 \sqrt[5]{32m^3} \times 5 \sqrt[5]{1024m^2}\)

31. Solve: \(\sqrt{3x - 8} + 1 = 3\)
Sample CBE Answers

1. 21

2. \(-1.6a - 40ab\)

3. Mean is 73, mode is 78, median is 73.

4. \(a = \frac{2}{3}\)

5. \(x = \frac{y+6}{3}\)

6. \(r = 9 \text{ or } r = -37\)

7. \(\frac{1}{2} \leq x\)

8. \(2 \leq x < 7\)

9. \(x \geq \frac{19}{3} \text{ or } x \leq -11\)

10. domain is \(\{-5, -2, -1, 2\}\); range is \(\{6, -4, -6\}\); the relation is a function.

11. \(f(-3) = -32\)

12. Graph should have a negative slope, crossing the \(x\)-axis at 5.5 and the \(y\)-axis at 11.

13. \(2x - y = 14\)

14. The slope is \(\frac{1}{2}\).

15. \(y = .75x + 13.5\)

16. \(y = -3x + 5\)

17. Graph should have a positive slope, with a broken line crossing the \(x\)-axis at -1 and the \(y\)-axis at 1 and shaded below.

18. The solution is \((1, 2)\).

19. \(x = 6.25\) and \(y = -2.25\)

20. The solution is \((2, -1, 1)\).
21. \[
\begin{pmatrix}
8 & -12 \\
16 & 4 \\
0 & 12
\end{pmatrix}
\]

22. The solution is (9.25, –2.25)

23. \[
\begin{pmatrix}
13 & -20 \\
12 & 17
\end{pmatrix}
\]

24. \(8x^7y^7\)

25. \(3.1 \times 10^4\)

26. \(2x^2 - 2x + 7\)

27. \(4x^3 + 7x^2 - 5x + 1\)

28. \((2x^2 + 5)(2x - 3)\)

29. \(3x^2y^5\)

30. \(240m\)

31. \(x = 4\)
ALG 2A Formula Sheet

General Formulas

Slope of a Line: \( m = \frac{y_2 - y_1}{x_2 - x_1} \)

Quadratic formula: \( x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \)

Value of a second order determinant: \( \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc \)

Cramer’s rule: The solution to the system \( \begin{cases} ax + by = e \\ cx + dy = f \end{cases} \) is \((x, y)\), where
\[
 x = \frac{\begin{vmatrix} e & b \\ f & d \end{vmatrix}}{\begin{vmatrix} a & b \\ c & d \end{vmatrix}}, \quad y = \frac{\begin{vmatrix} a & e \\ c & f \end{vmatrix}}{\begin{vmatrix} a & b \\ c & d \end{vmatrix}}, \quad \text{and} \quad \begin{vmatrix} a & b \\ c & d \end{vmatrix} \neq 0
\]

Scalar multiplication of a matrix:
\[
 k \begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix} = \begin{bmatrix} ka & kb & kc \\ kd & ke & kf \end{bmatrix}
\]

Expansion of a third-order determinant:
\[
 \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = a \begin{vmatrix} e & f \\ h & i \end{vmatrix} - b \begin{vmatrix} d & f \\ g & i \end{vmatrix} + c \begin{vmatrix} d & e \\ g & h \end{vmatrix}
\]

Area of triangles: The area of a triangle having vertices at \((a, b), (c, d),\) and \((e, f)\) is
\[
 |A|, \text{ where } A = \frac{1}{2} \begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix}
\]

continued →
Negative exponents: For any real number $a$, and any integer $n$, where $a \neq 0$,

$$a^{-n} = \frac{1}{a^n} \text{ and } \frac{1}{a^{-n}} = a^n$$

Degree of a constant: The degree of a constant is always zero

## Properties of powers

Suppose $m$ and $n$ are integers and $a$ and $b$ are real numbers. Then the following properties hold.

- **Power of a product:** $(ab)^n = a^m b^m$

- **Power of a quotient:**

  $$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}, \quad b \neq 0 \text{ and}$$

  $$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n \text{ or } \frac{b^n}{a^n}, \quad a \neq 0, \quad b \neq 0$$

**Multiplying Powers:** For any real number $a$ and integers $m$ and $n$, $a^m \times a^n = a^{m+n}$

**Dividing Powers:** For any real number $a$, except $a = 0$, and integers $m$ and $n$, $\frac{a^m}{a^n} = a^{m-n}$

## Factoring

**Any number of terms:**

- **Greatest Common Factor (GCF):**

  $$a^3 b^2 + 2a^2 b - 4ab^2 = ab(a^2 b + 2a - 4b)$$

**Two terms:**

- **Difference of Two Squares**

  $$a^2 - b^2 = (a + b)(a - b)$$

- **Sum of Two Cubes**

  $$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

- **Difference of Two Cubes**

  $$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

*continued →*
Three terms:

Perfect Square Trinomials

\[ a^2 + 2ab + b^2 = (a + b)^2 \]
\[ a^2 - 2ab + b^2 = (a - b)^2 \]

General Trinomials

\[ acx^2 + (ad + bc)x + bd = (ax + b)(cx + d) \]

Four or more terms:

Grouping

\[ ra + rb + sa + sb = r(a + b) + s(a + b) = (r + s)(a + b) \]

Logarithms

Product: \( \log_b(xy) = \log_b x + \log_b y \)

Quotient: \( \log_b \left( \frac{x}{y} \right) = \log_b x - \log_b y \)

Power: \( \log_b (x^r) = r \log_b x \)

Absolute Value Functions

Vertical translation

Parent function: \( y = |x| \)
Translation up \( k \) units, \( k > 0 \): \( y = |x| + k \)
Translation down \( k \) units, \( k > 0 \): \( y = |x| - k \)

Horizontal translation

Parent function: \( y = |x| \)
Translation right \( k \) units, \( k > 0 \): \( y = |x - h| \)
Translation left \( k \) units, \( k > 0 \): \( y = |x + h| \)

Combined translation

Translation right \( h \) units, up \( k \) units: \( y = |x - h| + k \)

continued →
Graph of a quadratic function in standard form

The graph of \( f(x) = ax^2 + bx + c \) is a parabola when \( a \neq 0 \).

- When \( a > 0 \), the parabola opens up. When \( a < 0 \), the parabola opens down.

- The axis of symmetry is the line \( x = -\frac{b}{2a} \).

- The \( x \)-coordinate of the vertex is \( -\frac{b}{2a} \). The \( y \)-coordinate of the vertex is the \( y \) value of the function when \( x = -\frac{b}{2a} \), or \( y = f\left(-\frac{b}{2a}\right) \).

- The \( y \)-intercept is \((0, c)\).

Discriminant of a matrix

<table>
<thead>
<tr>
<th>Value of the discriminant</th>
<th>Type and number of solutions for ( ax^2 + bx + c = 0 )</th>
<th>Examples of graphs of related functions ( y = ax^2 + bx + c )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( b^2 - 4ac &gt; 0 )</td>
<td>two real solutions</td>
<td>two ( x )-intercepts</td>
</tr>
<tr>
<td>( b^2 - 4ac = 0 )</td>
<td>one real solution</td>
<td>one ( x )-intercept</td>
</tr>
<tr>
<td>( b^2 - 4ac &lt; 0 )</td>
<td>no real solutions, two imaginary solutions</td>
<td>no ( x )-intercept</td>
</tr>
</tbody>
</table>
### Families of conic sections

<table>
<thead>
<tr>
<th>Conic Section</th>
<th>Standard Form of Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parabola</strong></td>
<td>Vertex (0,0)</td>
</tr>
<tr>
<td></td>
<td>( y = ax^2 )</td>
</tr>
<tr>
<td></td>
<td>( x = ay^2 )</td>
</tr>
<tr>
<td></td>
<td>Vertex (( h, k ))</td>
</tr>
<tr>
<td></td>
<td>( y - k = a(x - h)^2 ) or ( y = a(x - h)^2 + k )</td>
</tr>
<tr>
<td></td>
<td>( x - h = a(y - k)^2 ) or ( x = a(y - k)^2 + h )</td>
</tr>
<tr>
<td><strong>Circle</strong></td>
<td>Center (0,0)</td>
</tr>
<tr>
<td></td>
<td>( x^2 + y^2 = r^2 )</td>
</tr>
<tr>
<td></td>
<td>Center (( h, k ))</td>
</tr>
<tr>
<td></td>
<td>( (x - h)^2 + (y - k)^2 = r^2 )</td>
</tr>
<tr>
<td><strong>Ellipse</strong></td>
<td>Center (0,0)</td>
</tr>
<tr>
<td></td>
<td>( \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 )</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>( \frac{(x - h)^2}{b^2} + \frac{(y - k)^2}{a^2} = 1 )</td>
</tr>
<tr>
<td><strong>Hyperbola</strong></td>
<td>Center (0,0)</td>
</tr>
<tr>
<td></td>
<td>( \frac{x^2}{a^2} - \frac{y^2}{b^2} = 1 )</td>
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