A. Sign your scantron sheet on the back at the bottom in ink.

B. Write and encode in the spaces indicated:
   1) Name (last name, first initial, middle initial)
   2) UFID Number
   3) Discussion Section Number

C. Under "spacial codes", code in the test ID number 2,3:

   1   •  3  4  5  6  7  8  9  0
   1  2   •  4  5  6  7  8  9  0

D. At the top right of your scantron, for "Test Form Code", encode C.

   A  B  •  D  E

E. Students are responsible for making sure their test consists of 14 multiple choice questions and 4 pages of tear-off free response questions. The time allowed is 90 minutes.

F. When you are finished:

   1) Before turning in your test, check for transcribing errors. Any mistakes you leave in are there to stay.
   2) You must turn in the scantron sheet to your discussion leader.
   3) Answers will be posted later today on the class website.
Be sure to bubble the answers to each question on your scantron. The exam is worth 79 points, so you can earn up to 4 bonus points.

The following problems are worth four points each.
(Except for Bonus problems are worth 2 points each)

1. \[ f(x) = 7x^8 - 2x^2 + 1 \] is an even function.

   a. True  
   b. False  

2. \[ f(x) = |x + 4| \] has an inverse function.

   a. True  
   b. False  

3. (Bonus) The point \((3, -8)\) is on the graph of \(y = g(x)\). Give the coordinates of the corresponding point on the graph of the function \(-2g(x)\).

   a. \((-6, -8)\)  
   b. \((3, -2)\)  
   c. \((3, -4)\)  
   d. \(\left(\frac{3}{2}, -8\right)\)  
   e. \((3, 16)\)  

4. (Bonus) Consider the graph of \(f(x)\) given below (darker curve). Find a possible formula for the transformation of \(f\) shown below on the same coordinate system.

   a. \(-f(x) + 2\)  
   b. \(-f(x) - 1\)  
   c. \(2f(x) + 1\)  
   d. \(2f(x) - 1\)  
   e. \(-f(x) + 1\)
5. How many of the linear equations below has/have a slope of $-1$?

$x + y = 1, \quad x + y = -5, \quad 2x + 2y = -1, \quad x = y + 1, \quad 2y = -x + 1$

a. 3 \quad b. 1 \quad c. 2 \quad d. 0 \quad e. 4

6. A rectangle is bounded by the $x$–axis and the parabola $y = -x^2 + 4$ (see figure). Write the area $A$ of the rectangle as a function of $x$.

\[
\begin{array}{c}
a. A(x) = 4x(x^2 + 4) & b. A(x) = 2x(4 - x^2) \\
c. A(x) = 4x(x^2 - 4) & d. A(x) = 2x(4 + x^2)
\end{array}
\]

7. Find the center $c$ and radius $r$ of the circle $2x^2 + 2y^2 - 4x + 6y = -1$.

a. Not a circle equation \quad b. $c : (2, -2); r = \frac{1}{2}$ \quad c. $c : (1, -\frac{3}{2}); r = \frac{1}{2}$

d. $c : (1, -\frac{3}{2}); r = \frac{\sqrt{11}}{2}$ \quad e. $c : (2, -2); r = \frac{\sqrt{11}}{2}$

8. Which equation represents the equation of a circle centered at $(2, -1)$ with radius 2?

a. $x^2 + y^2 - 4x + 2y = -1$ \quad b. $x^2 + y^2 + x + 2y = 1$

c. $x^2 + y^2 - 4x + 2y = -3$ \quad d. $x^2 + y^2 + 4x - 2y = -1$

e. $x^2 + y^2 = 4$

9. Find $k$ so that the line through the points $(8, -2), (k, 4)$ is parallel to the line $x + y + 1 = 0$.  

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10. Let \( f(x) = \frac{x + 1}{|x - 2|} \). Find the average rate of change of \( f(x) \) from 5 to \( x \), where \( x > 2 \).

\[
\begin{array}{lllll}
\text{a. } & \frac{x + 1}{x - 2} & \text{b. } & -x & \text{c. } & \frac{1}{2 - x} \\
\text{d. } & \frac{5 - x}{x - 2} & \text{e. } & -1
\end{array}
\]

11. Solve the inequality: \( 3 - |x + 1| < 1 \).

\[
\begin{array}{lll}
\text{a. No solution} & \text{b. } & (-\infty, \infty) \\
\text{c. } & (-\frac{5}{2}, \frac{7}{2}) \\
\text{d. } & (-\infty, -3) \cup (1, \infty) & \text{e. } & (-\infty, -\frac{7}{2}) \cup (\frac{3}{2}, \infty)
\end{array}
\]

12. Given that \( f \) is a 1-to-1 function, and that \( f^{-1}(0) = 1, f(3) = 2, f(4) = 5 \), find \( f^{-1}(5) - f^{-1}(2) + f(1) = \)

\[
\begin{array}{lllll}
\text{a. } & 9 & \text{b. } & 7 & \text{c. } & 1 \\
\text{d. } & 2 & \text{e. } & 3
\end{array}
\]
The following problems are worth five points each.

13. Let \( f(x) = \frac{1 - 2x}{1 + 3x} \), \( g(x) = \begin{cases} x^2, & x < 1 \\ 1, & 1 < x < 3 \\ x, & x \geq 3 \end{cases} \)

and \( h(x) = (x - 1)^2 - \frac{1}{2} \).

If \( a \) is the zero of \( f(x) \), \( b = g(2) \), and \( c \) the \( y \)-intercept of \( h(x) \), then \( b - a - c = \) ____.

a. \(-1.5\)  

b. \(-2\)  

c. \(-2.5\)  

d. \(0\)  

e. \(3.5\)

14. Let \( f(x) = \begin{cases} \frac{\sqrt{x - 1}}{x^2 - 4}, & 1 \leq x \leq 3 \\ \frac{1}{x + 4}, & 4 < x \end{cases} \)

The domain of this function \( f(x) \) is:

a. \([1, 2) \cup (2, 4) \cup (4, \infty)\)  

b. \([1, 4) \cup (4, \infty)\)  

c. \([1, 2) \cup (4, \infty)\)  

d. \([1, 3] \cup (4, \infty)\)  

e. \([1, 2) \cup (2, 3] \cup (4, \infty)\)
You must show all work to receive full credit!

1. Find the equation of the parabola shown in the figure.

(i) Write the equation of the parabola in standard form $y = a(x - h)^2 + k$. (leave $a$ as 'a' for now),

$$ y = \_\_\_\_\_\_\_\_\_\_\_ $$

(ii) Determine the leading coefficient $a$.

$$ a = \_\_\_\_\_\_\_\_\_\_\_ $$

(iii) Using the result from (ii), replace 'a' in the equation in (i):

$$ y = \_\_\_\_\_\_\_\_\_\_\_ $$

(iv) Find the $y$-intercept:

$$ y\text{-intercept} = \_\_\_\_\_\_\_\_\_\_\_ $$

(v) What's the range of the $y$ values (in interval notation)?

Range: \_\_\_\_\_\_\_\_\_\_\_
2. Given \( f(x) = \frac{1}{x^2 - 16} \), \( g(x) = \sqrt{16 - x^2} \), find:

(i) \((f \circ g)(x)\). (simplify your answer)

\[(f \circ g)(x) = \quad \]

(ii) the domain of \((f \circ g)(x)\). (in interval notation)

(iii) \(f(g(3))\).

\[f(g(3)) = \quad \]

(iv) \(\left(\frac{f}{g}\right)(x)\).
(simplify your fraction, no need to rationalize the denominator)

\[\left(\frac{f}{g}\right)(x) = \quad \]

(v) the domain of \(\left(\frac{f}{g}\right)(x)\). (in interval notation)

\[\text{domain of } \left(\frac{f}{g}\right)(x) = \quad \]

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3. Restrict the domain of \( f(x) = x^2 + 2 \) to \( x \leq 0 \) so that \( f \) is one-to-one and has an inverse function \( f^{-1} \).

(i) Find \( f^{-1} \).

\[ f^{-1} = \ldots \]

(ii) Find the domain of \( f^{-1} \).

Domain of \( f^{-1} = \ldots \)

(iii) Find the range of \( f^{-1} \).

Range of \( f^{-1} = \ldots \)

(iv) In the same coordinate system, sketch both \( f \) (as a dashed line) and \( f^{-1} \) (as a solid line).

![Graph of f and f^{-1}](image-url)
4. The price $p$ and the quantity $x$ sold of a certain product obey the demand equation

$$p = -\frac{1}{4}x + 100, \ 0 \leq x \leq 600.$$ 

(a) Express the revenue $R$ as a function of $x$.

$$R(x) = \text{__________}$$

(b) What’s the revenue if 6 units are sold?

$$\text{revenue= \text{__________}}$$

(c) What quantity $x$ maximizes revenue?

$$x = \text{__________}$$

(d) What is the maximum revenue?

$$\text{Maximum revenue=} \text{__________}$$

(e) What price should the company charge to obtain maximum revenue?

$$\text{price=} \text{__________}$$