MAC 1147
Fall 2021

EXAM 1A

A. Sign and date your scantron on the back at the bottom.

B. In pencil, write and encode in the spaces indicated on your scantron:

   1) Name (last name, first initial, middle initial)

   2) UF ID Number

   3) Section Number — Do not fill this out.

C. Under "special codes" on your scantron, code in the test ID number 1, 1.

   ● 2 3 4 5 6 7 8 9 0

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

   ● B C D E

E. 1) This exam has 23 multiple-choice questions and 2 free response questions. Each question has equal weight.

   2) The time allowed is 90 minutes.

   3) You may write on the test.

   4) Raise your hand if you need more scratch paper or if you have a problem with your test. DO NOT LEAVE YOUR SEAT UNLESS YOU ARE FINISHED WITH THE TEST.

F. **KEEP YOUR SCANTRON COVERED AT ALL TIMES.**

G. When you are finished:

   1) Before turning in your test, check for transcribing errors. Any mistakes you leave in are there to stay.

   2) Take your test, scratch paper, and scantron to your TA. Be prepared to show your UF ID card.

   3) Answers will be posted in Canvas after the exam.

H. By taking this exam, you agree to the following **Honor Pledge:**

   "I will neither give nor receive any unauthorized aid for this exam."

Questions 1–20 are worth 4 points each.

1. Choose the value that is not a rational number but is a real number:

   A. $\frac{\sqrt{4}}{9}$

   B. $-.181818...$

   C. $\sqrt{-5}$

   D. $\frac{3}{\sqrt{7}}$

   E. All of these are rational and real numbers.

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2. $\sqrt{9} =$

   A. 81   B. 3   C. ± 3 D. -3 E. ± 81

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3. Subtract.
   $(4n^5 - 5n^3 + 7n^2 - 4n + 6) - (2n^5 + 4n^2 - 5n^3 + 11 + 2n^4) =$

   A. $6n^5 - 2n^4 - 10n^3 + 3n^2 - 4n - 5$

   B. $6n^5 + 2n^4 - 10n^3 + 11n^2 - 4n + 17$

   C. $2n^5 + 2n^4 + 11n^2 - 4n + 17$

   D. $2n^5 - 2n^4 + 3n^2 - 4n - 5$

   E. $2n^5 - 2n^4 - 10n^3 + 11n^2 - 4n - 5$

4. The graph of each equation below is a circle. Which one has exactly one x-intercept?

A. $(x - 8)^2 + (y - 1)^2 = 4$ B. $(x - 4)^2 + (y - 5)^2 = 25$ C. $(x - 3)^2 + (y - 4)^2 = 36$

D. $(x - 1)^2 + (y - 9)^2 = 1$ E. $(x - 6)^2 + (y - 6)^2 = 16$

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5. Choose the *true* statement:

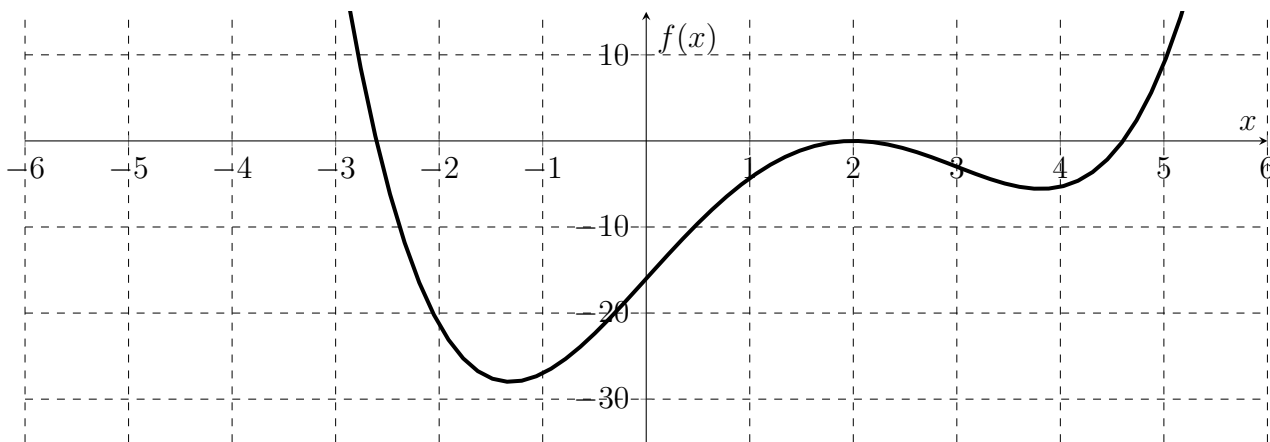A. Every function is a relation, and every relation is a function

B. If $f(5) = -9$ then the points $(5, 0)$ and $(0, -9)$ lie on the graph of f.

C. Every function has a domain and a range.

D. A relation is a function if each of its inputs corresponds to one or more outputs.

E. Graphically, a zero of a function corresponds to a y-intercept.

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6. On which interval(s) is the function graphed below concave down?

A. $(1, \infty)$ B. $(-\infty, 0) \cup (3, \infty)$ C. $(-\infty, 1)$

D. $(0, 3)$ E. $(0, 1) \cup (3, \infty)$

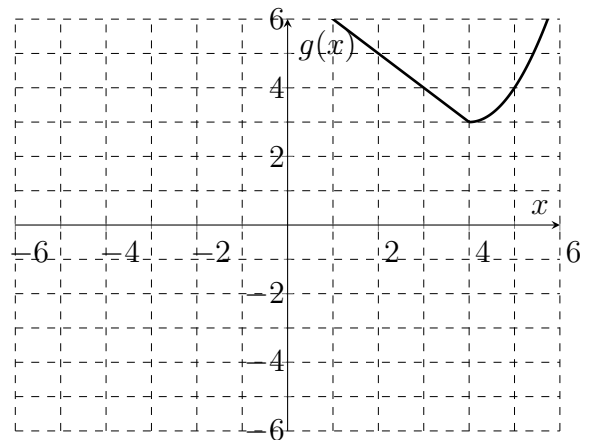---

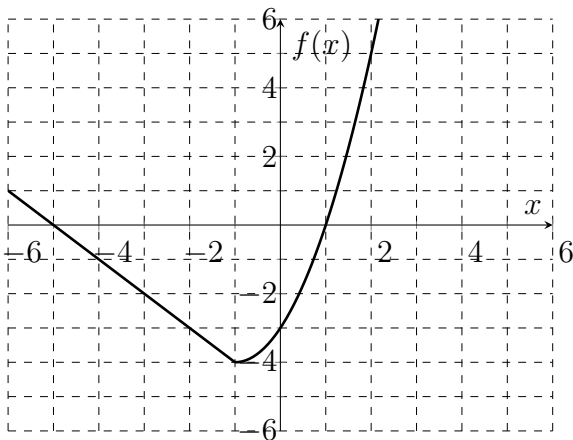7. Use the functions below to evaluate $(f \circ g)(-3)$.

$$f(x) = -(x-3)^2 + 11$$

x	-3	-2	-1	0	1	2	3
$g(x)$	4	3	2	1	0	-1	-2

$(f \circ g)(-3) =$

A. 10 B. 26 C. -14 D. -10 E. 2

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8. The graph of $g(x)$ below is a translation of the graph of $f(x)$. What is the formula for $g(x)$ in terms of $f(x)$?

A. $g(x) = f(x) - 7$ B. $g(x) = f(x-5) + 7$ C. $g(x) = f(x+5) + 7$

D. $g(x) = f(x+5) - 7$ E. $g(x) = f(x-5) - 7$

9. Select the *false* statement.

    A. If $f(x)$ and $g(x)$ are inverses, then the graph of $f(x)$ is a reflection of the graph of $g(x)$

    B. $f^{-1}(f(x)) = x$ for all x in the domain of f

    C. If the domain of $f(x)$ is all real numbers, then so is the domain of $f^{-1}(x)$

    D. If $f(x)$ and $g(x)$ are inverses, then $(f \circ g)(x) = x$ and $(g \circ f)(x) = x$

    E. If $f(9) = -8$ then $f^{-1}(-8) = 9$

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10. Solve the equation. What is the sum of all the solutions?

$$x^3 - 7x^2 - 9x = -63$$

    A. 10   B. 21   C. 13   D. 0   E. 7

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11. Find the x-intercept(s) of the equation below.

$$x^2 y - 6y - 11 = y^2 - 2x + 7xy$$

    A. $x = \dfrac{7}{6}, 0$ B. $x = \dfrac{7}{6}$ C. $x = \dfrac{6}{7}$ D. $x = \dfrac{11}{2}$ E. $x = \dfrac{11}{2}, 0$

12. Suppose that $f(x)$ is increasing on the interval (a, b). Select the statement that *must* be true.

    A. $f\left(\frac{a+b}{2}\right) > f(a)$

    B. $f(x)$ has a root in the interval (a, b)

    C. $f(x)$ has an absolute maximum in the interval (a, b)

    D. $f(b) > 2 \cdot f(a)$

    E. The graph of $f(x)$ bends upwards on the interval (a, b)

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13. Suppose that

$$f(x) = \begin{cases} 3x + 4 & x < 5 \\ 7 & x = 5 \\ (x - 2)^2 + 7 & x > 5 \end{cases}$$

    $f(0) + f(7) =$

    A. 36   B. 11   C. 32   D. 20   E. 32

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14. Choose the expression that is equivalent to $3\sqrt{125} + 8\sqrt{20}$.

    A. $31\sqrt{5}$ B. $11\sqrt{145}$ C. $11\sqrt{5}$ D. $7\sqrt{10}$ E. $7\sqrt{5}$

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15. Choose the equation that has symmetry across the x-axis.

    A. $x^2 + y = 1$ B. $x^2 + y^2 + y = 1$ C. $x^2 + y^2 + x = 1$

    D. $x^2 + x + y = 1$ E. $x^2 + y^2 + x + y = 1$

5A

16. Suppose that $f(z) = -3z + 15$ and $g(z) = (z - 8)^2 + 3$.
    What is $(fg)(6) + (f + g)(6)$?

    A. -2 B. -42 C. 128 D. -17 E. 8

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17. Which of the functions below transforms the graph of $f(x) = x^2$ by shifting it left by 6 units, then stretching it vertically by a factor of 2, then shifting it up by 2 units?

    A. $g(x) = 2x^2 - 24x + 74$ B. $g(x) = 2x^2 - 12x + 70$ C. $g(x) = 2x^2 + 24x + 74$

    D. $g(x) = 2x^2 + 12x + 38$ E. $g(x) = 2x^2 + 24x + 70$

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18. Express the domain of the function $h(x) = \dfrac{3x + 7}{x^2 - 8x - 33}$ in interval notation.

    A. $(-3, 11)$

    B. $(-\infty, -3) \cup (-3, 11) \cup (11, \infty)$

    C. $(-\infty, -3) \cup (11, \infty)$

    D. $(-\infty, -3) \cup (-3, 11)$

    E. $(-3, 11)$

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19. Suppose that $f(r) = (r - 4)^5 + 7$. What is $f^{-1}(r)$?

    A. $f^{-1}(r) = \sqrt[5]{r - 4} + 7$ B. $f^{-1}(r) = \sqrt[5]{r} + 11$ C. $f^{-1}(r) = \sqrt[5]{r - 11}$

    D. $f^{-1}(r) = \sqrt[5]{r} - \sqrt[5]{7} + 4$ E. $f^{-1}(r) = \sqrt[5]{r - 7} + 4$

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20. Suppose that $x > 0$ and $y > 0$. The expression $\dfrac{\sqrt[5]{x^{11}}}{\sqrt[7]{y^4}}$ can be written in the form $x^c y^d$. What is the value of $c + d$?

    A. $\frac{57}{35}$ B. $\frac{57}{2}$ C. $\frac{97}{12}$ D. $\frac{57}{12}$ E. $\frac{97}{35}$

21. Select the *false* statement.

    A. If a and b are integers then $a + b$ is also an integer.

    B. Any real number that is not a rational number is an irrational number.

    C. If n is a natural number, then $\sqrt{n}$ is an irrational number.

    D. The integers consist of the positive and negative natural numbers, and 0.

    E. If a and b are nonzero integers then $\frac{a}{b}$ is a rational number.

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22. Select the graph that is decreasing and concave up.

A.

B.

C.

D.

E.

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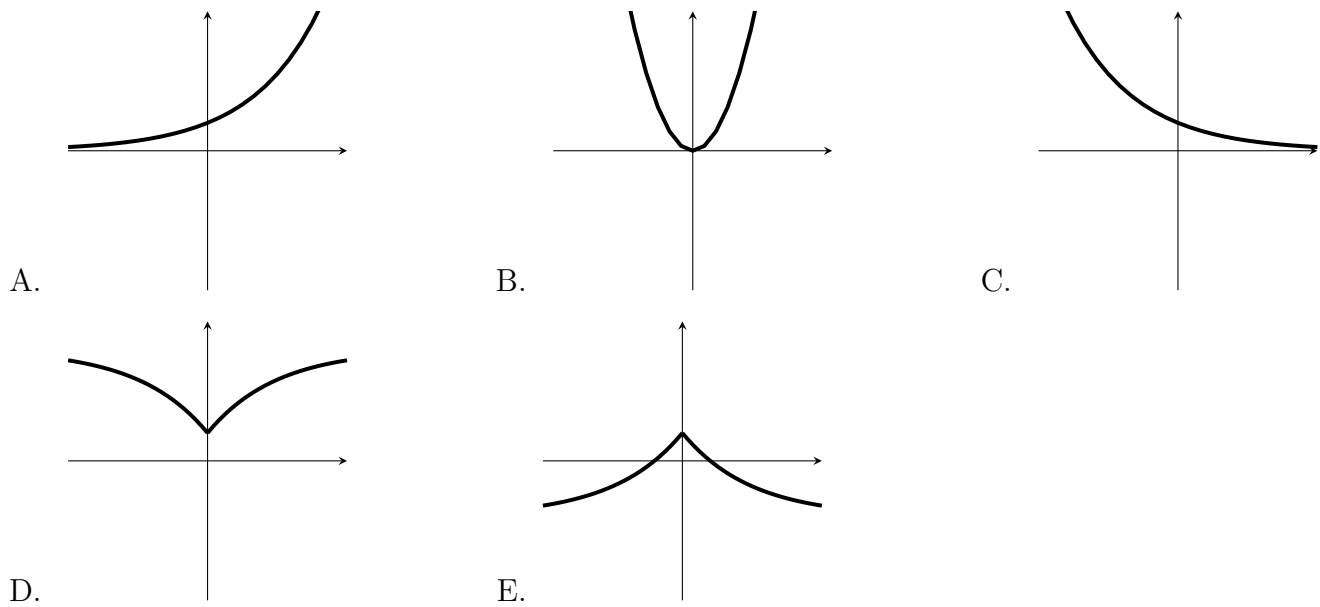
23. Multiply.

$$(x - 6)(x^2 + 9x + 3) =$$

    A. $x^3 - 51x^2 + 18x - 6$ B. $x^3 - 51x^2 + 3x - 3$ C. $x^3 + 3x^2 - 51x - 18$

    D. $x^3 + 3x^2 + 9x - 18$ E. $x^3 + x^2 + 3x - 18$

YOU MUST SHOW ALL WORK TO RECEIVE FULL CREDIT.

Free response questions 24-25 are worth 4 points each.

24. Use the equation of a circle given below to answer the questions. You must show understandable work in order to receive credit.

$$x^2 + y^2 - 8x - 10y + 5 = 0$$

a. (2 pts) Find the center and radius of the circle.

Center:_____   Radius:_____

b. (2 pts) Find any y-intercepts the circle has or show that it has none. Give your answers as points and simplify any radicals.

y-intercept(s):_____

8A

25. On the axes below, sketch the graph of a function $g(x)$ that has the following properties. Each property is worth 1 point.

- $g(x)$ is increasing only on the interval $(2, 5)$.

- $g(x)$ is concave up only on the interval $(-1, 5)$.

- $g(x)$ has an absolute minimum when $x = 2$.

- $g(x)$ is constant only on the interval $(-5, -1)$.
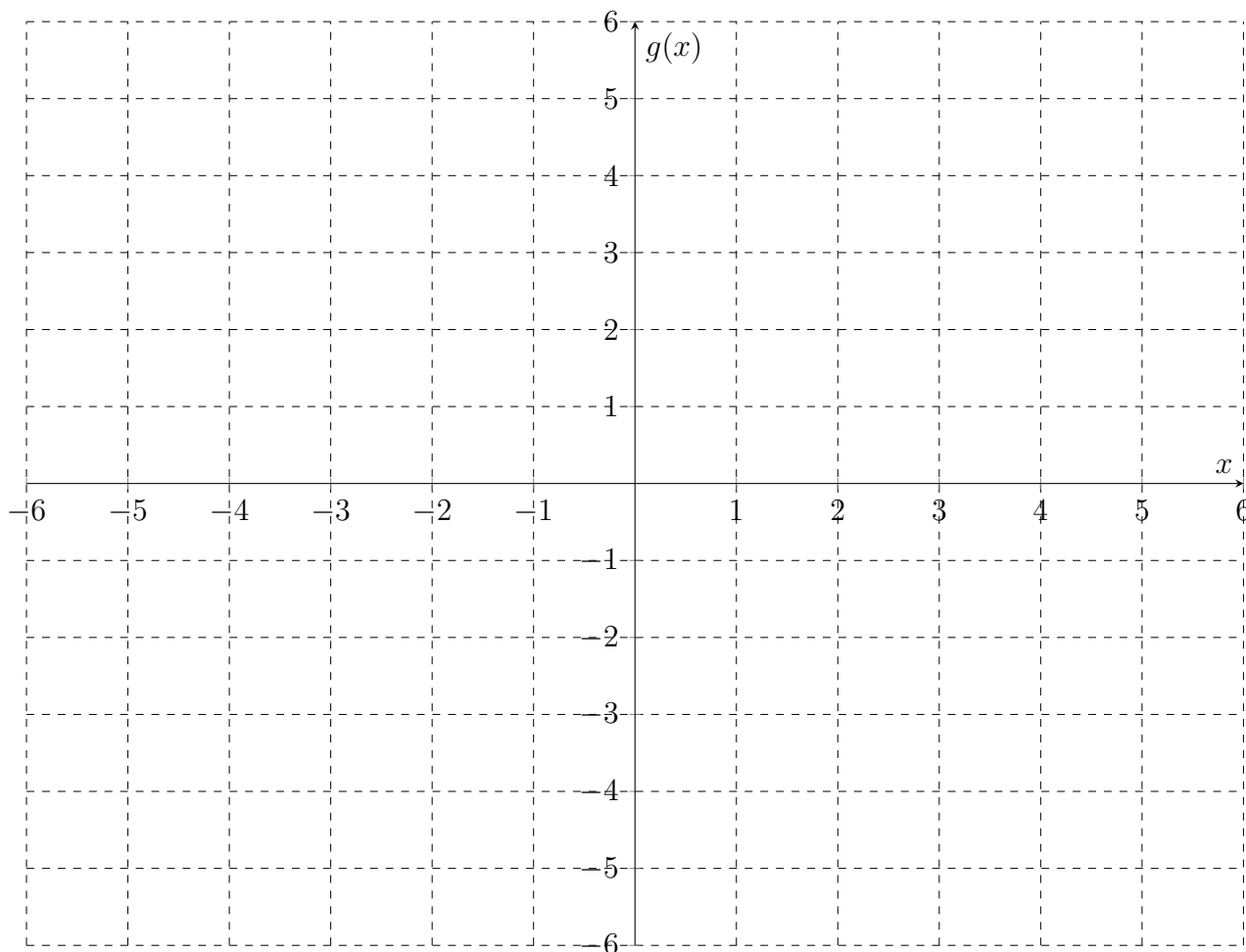
Turn in your scantron and your free response to your TA. The worked-out solutions will be posted on Canvas after the test.