

Mathematics 5 — Quarter, Year  
Midterm 1

Instructor: David Weisbart

Calculators, notes and books may not be used in this examination.

You may not receive full credit for a correct answer if insufficient work is shown, but you are not required to simplify your answers.

Only writing contained in the provided boxes will be scored.

The exam contains 12 questions with 104 possible points.

(72 points – Recall)      Questions R1–R8 are each worth **nine points**.  
(16 points – Analysis)      Questions A1 and A2 are each worth **eight points**.  
(16 points – Synthesis)      Questions S1 and S2 are each worth **eight points**.

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R1. Graph on a number line the set of all  $x$  satisfying the inequalities

$$2x - 3 \leq 1 \quad \text{and} \quad 3x + 2 \geq -7.$$

R2. Let  $L$  be the line containing points  $(4, 1)$  and  $(2, 6)$ . Find an equation for  $L$ .

R3. Suppose that  $a$  is a real number and that  $f$  and  $g$  are given by

$$f(x) = 2x^2 - \sqrt{x} \quad \text{and} \quad g(x) = x + a.$$

Compute  $(f \circ g)(x)$ . Do **not** simplify your answer.

R4. One yard is three feet and one hour is sixty minutes. Write  $5 \frac{\text{feet}}{\text{minute}^2}$  in units of yards and hours. Do **not** simplify your answer.

R5. Let  $L$  be the line segment with endpoints  $(1, 4)$  and  $(4, 10)$ . Find a point  $p$  on  $L$  such that the distance from  $(1, 4)$  to  $p$  is one third the length of  $L$ .

R6. Let  $L$  be the line containing  $(1, 2)$  and  $(5, 2)$ . Find a point on  $L$  that is a distance of 2 from  $(1, 2)$  and to the right of  $(1, 2)$ .

R7. Suppose that  $f$  and  $g$  are given by

$$g(x) = 2x + 1 \quad \text{and} \quad f(x) = \sqrt{x}.$$

What is the domain of  $f \circ g$ ?

R8. Suppose that the function  $f$  is given by  $f(x) = \frac{x+2}{x-3}$ . Calculate  $f^{-1}(x)$ .

A1. Write the function  $f$  given by

$$f(x) = |x + 1| + |2x + 6|$$

as a piecewise defined function.

A2. Let  $L_1$  be the line passing through  $(1, 2)$  and  $(3, 5)$ . Let  $L_2$  be the line passing through  $(1, 5)$  and perpendicular to  $L_1$ . Where do  $L_1$  and  $L_2$  intersect?

S1. Let  $L_1$  be the line passing through  $(0, 0)$  and  $(1, 2)$ . Let  $L_2$  be the line passing through  $(1, 4)$  and  $(2, 8)$ . Find an equation of the line given by the reflection of  $L_2$  across  $L_1$ .

S2. One yard is three feet. You build a box that has a volume of 100 cubic feet. It takes two people ten minutes to spray paint this box. How many minutes does it take three people to spray paint a box that has a volume of 500 cubic feet? Assume that the area of surface to be covered is proportionate to both the number of people working and the time spent spray painting.