

Name: _____
Student ID: _____

Test 2

This test is graded out of 50 marks. No books, notes, graphing calculators or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

Question 1.

- a. (4 marks) Find the *distance* and the *midpoint* of the line segment joining the points (2,3) and (4,3).
- b. (2 marks) Find the equation of the circle whose center is (2,3) if (4,3) is a point on the circle.

Question 2. (4 marks) Use the x and y intercepts to graph the linear function.

$$2x - 3y = 6$$

Question 3. Let $f(x) = \frac{1}{x+2}$ and $g(x) = \frac{x}{x^2+1}$.

- a. (4 marks) Determine $\frac{f(x+h)-f(x)}{h}$ and simplify.
- b. (1 marks) Determine the domain of $f(x)$.
- c. (2 marks) Determine $(f \circ g)(x)$ and $(g \circ f)(x)$. *Do not simplify*
- d. (bonus 1 mark) Determine the range of $f(x)$.

Question 4. Let $f(x) = 2x^2 - 8x + 6$.

- a. (2 marks) Determine the vertex of $f(x)$ by completing the square.
- b. (1 mark) Determine the orientation of the parabola and state whether the vertex is a minimum or maximum.
- c. (1 mark) Determine the y -intercept.
- d. (1 mark) Determine the x -intercept(s).
- e. (1 mark) Sketch the graph of $f(x)$.
- f. (2 marks) Determine the domain and range of $f(x)$.

Question 5. (4 marks) Sketch the graph defined by

$$f(x) = \begin{cases} -x - 1 & \text{if } x \leq -1 \\ x^2 - 1 & \text{if } x > 1 \end{cases}$$

Question 6. (4 marks) Find the equation of the line that passes through the point $(1, 2)$ and is perpendicular to the line $2x + 5y = 10$.

Question 7. Let $f(x) = 2^{x-1} + 2$.

- a. (4 marks) Find $f^{-1}(x)$.
- b. (4 marks) Sketch the graph of $f(x)$, $y = x$ and $f^{-1}(x)$ on the same cartesian plane.
- c. (1 mark) Determine the domain of $f^{-1}(x)$.

Question 8. Solve for x :

a. (4 marks) $\log_6(x+3) = 1 - \log_6(x+4)$

b. (4 marks) $27^{x-8} = \left(\frac{1}{3}\right)^{x+4}$

Bonus.

- a. (2 marks) Prove that $f^{-1}(x) = \log_a x$ is the inverse of $f(x) = a^x$ by showing that $(f \circ f^{-1})(x) = x$ and $(f^{-1} \circ f)(x) = x$.
- b. (2 marks) If $f(x) = 2x^2 - 1$ and $g(x) = x + 2$ then find all values of x such that $(g \circ f)(x) - [g(x)]^2 = 2$.