MA129 Mock Midterm

Name: _____

Time Allowed: 80 minutes
Total Value: 60 marks
Number of Pages: 8

Instructions:

Cheat Sheet: One 8.5" × 11" page of study notes (both sides) is allowed as a reference while completing the mock test. Please note, that the cheat sheet is permitted for the mock test only!!

Non-programmable, non-graphing calculators are permitted. No other aids allowed.

Check that your test paper has no missing, blank, or illegible pages. Note that test questions appear on ***both*** *sides of the paper.*

Answer in the spaces provided.

Show all your work. Insufficient justification will result in a loss of marks.

1. [4 *marks*] Let $A = \begin{bmatrix} 2 & -4 & 3 \\ -1 & 1 & -2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 & -2 \\ 3 & -5 & -1 \end{bmatrix}$ and $C = \begin{bmatrix} -1 & 2 & 0 \\ 4 & 0 & -2 \\ 1 & 6 & 3 \end{bmatrix}$.

   Determine each of the following, if possible:

   (a) $3A - B$

   (b) BC

2. [4 *marks*] Simplify each of the following expressions.

(a) $\dfrac{\left(2x^4y^{-2}\right)^3}{(xy^5)^{-2}}$

(b) $\dfrac{x^2-4}{6x^2-18x-12}\cdot\dfrac{4x^2-2x}{x^2+x-2}$

3. [5 *marks*] Solve the following inequality for x. State your answer using interval notation.

$$\frac{2}{x}\leq\frac{3}{x-5}$$

4. [5 *marks*] Solve the system of linear equations if it is consistent, or prove that there is no solution if the system is inconsistent:

$$\begin{aligned} 3x - 2y + z &= 2 \\ 4x - 5z &= -1 \\ -10x + 3y + 8z &= 4 \end{aligned}$$

5. [3 *marks*] A business-copier repair company charges a fixed amount F, plus an hourly rate R for a service call. A customer is billed \$152 for a one-hour service call and \$332 for a three-hour service call. Determine the fixed amount and the hourly rate the company charges for a service call.

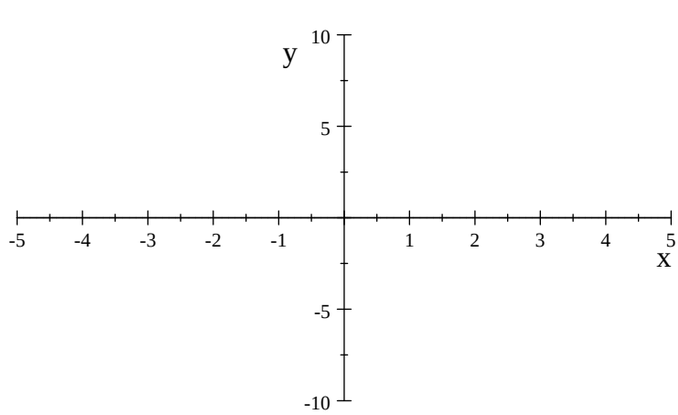
6. [3 *marks*] Determine an equation of the line which has a x-intercept of 3 and passes through the point $(-5, 6)$.

7. [6 *marks*] Consider the parabola given by $y = 2x^2 - 12x + 10$.

   (a) Determine the x-intercepts of the parabola.

   (b) Determine the coordinates of the parabola's vertex.

   (c) Sketch the graph of the parabola.



8. [6 *marks*] Consider the functions $f(x) = \dfrac{x+5}{x^2-9}$ and $g(x) = \sqrt{4-x}$.

(a) State the domain of f and the domain of g.

(b) Determine $f(2+h)$ and simplify the resulting expression.

(c) Determine $f(g(x))$ and then evaluate $f(g(-12))$.

9. [10 *marks*] Solve each of the following equations for x.

(a) $3^{7x-5} = 27^{x+2}$

(b) $4e^{2x-1} = 23$

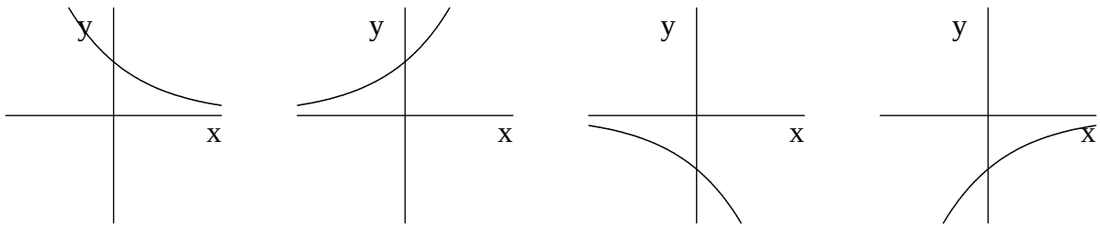
(c) $2\log_x 3 = \dfrac{1}{2}$

(d) $\log_2(x+4) + \log_2(x) = 3$

10. [5 *marks*] Consider the function $f(x) = \dfrac{2}{x}$. Use the limit definition of a derivative to verify that $f'(x) = -\dfrac{2}{x^2}$.

11. [4 *marks*]

(a) Which of the following graphs represents the function $f(x) = \left(\dfrac{7}{4}\right)^x$?

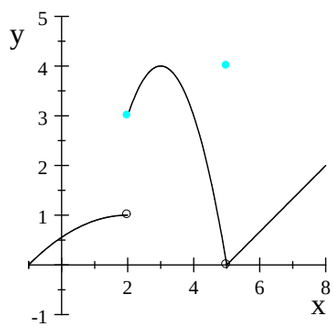


A B C D

Answer: _____

From the appropriate graph, determine $\lim\limits_{x \to -\infty} \left(\dfrac{7}{4}\right)^x =$ _____

(b) Consider the graph of a function $y = g(x)$ given to the right.



Evaluate:

(i) $\lim\limits_{x \to 2^-} g(x) =$ _____

(ii) $\lim\limits_{x \to 5} g(x) =$ _____

12. [7 *marks*] Determine the derivative of each of the following functions.

(a) $f(x) = \dfrac{x^2 - 2x + 5}{\sqrt{x}}$

(b) $g(x) = (2x - 3)^6 \cdot \ln\left(3x^2 - x + 4\right)$

(c) $h(x) = \dfrac{e^{x^3} - 2^{3-4x}}{x^2 + 1}$