MTH 126
Exam 1, Form A
Fall 2023

Formulas are on the last page, which you may pull off.

Calculators are allowed. You may use a scientific calculator or a graphing calculator (e.g., TI-84) but not one with CAS (e.g., no TI-89, no TI-Nspire CAS). You may not use a phone app.

Show work to support each answer, to be eligible for full credit. Be neat and organized. Clearly indicate your answers.

100 points possible. 9 problems at 11 points each, plus 1 free point.

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1. Simplify. Only positive exponents in your answer.

$$\left(\frac{4x^{-3}y^{7}}{3x^{5}y^{-4}}\right)^{-2}$$

2. Simplify.

$$\frac{x^2-10x-11}{x^2-49} \div \frac{x^2-9x-22}{x^2-5x-14}$$

3. If $f(x) = -x^2 - 17x + 2$, find the following and simplify.

(a) $f(-2)$

(b) $f(x + h)$

4. Solve the system by elimination.

$$\begin{aligned} 4x - 6y &= \quad 26 \\ -3x + 5y &= -21 \end{aligned}$$

5. Solve the equation using the quadratic formula. Give real answers (a) exactly (this means leave the square root symbol in your answer) and (b) rounded to two decimal places.

$$x(2x - 3) = 8$$

6. If a company has total costs $C(x) = 16{,}000 + 54x + 0.2x^2$ and total revenues given by $R(x) = 424x - 1.8x^2$, find the number of units that maximizes profit and find the maximum profit.

7. Chemists use the pH of a solution to measure its acidity or basicity. The pH is given by the formula $\text{pH} = -\log[\text{H}^+]$ where the symbol $[\text{H}^+]$ stands for the concentration of hydrogen ion in moles per liter. Find the approximate pH of these.

(a) Liquid A: $[\text{H}^+] = 1.259 \times 10^{-6} = 0.000001259$

(b) Liquid B: $[\text{H}^+] = 3.162 \times 10^{-7} = 0.0000003162$

8. Solve $58 = 200 - 200e^{-0.03x}$

(Show the algebra to justify your answer. Round your answer to 3 decimal places.)

9. (a) Rewrite the expression as a sum or difference of two logarithmic functions containing no exponents or radicals.

$$\log_4 \sqrt{\frac{x}{x+64}}$$

(b) Rewrite the expression as a single logarithm.

$$6\log_5(x^2+8) + \frac{1}{2}\log_5(x^2+16)$$

MTH 126
Exam 1, Form B
Fall 2023

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Show work to support each answer, to be eligible for full credit. Be neat and organized. Clearly indicate your answers.

100 points possible. 9 problems at 11 points each, plus 1 free point.

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1. Simplify. Only positive exponents in your answer.

$$\left(\frac{3x^3y^{-3}}{4x^{-7}y^4}\right)^{-2}$$

2. Simplify.

$$\frac{x^2-49}{x^2+10x-11} \div \frac{x^2+5x-14}{x^2+9x-22}$$

3. If $f(x) = -x^2 - 19x + 2$, find the following and simplify.

(a) $f(-2)$

(b) $f(x + h)$

4. Solve the system by elimination.

$$\begin{aligned} 4x - 6y &= \quad 24 \\ -3x + 5y &= -19 \end{aligned}$$

5. Solve the equation using the quadratic formula. Give real answers (a) exactly (this means leave the square root symbol in your answer) and (b) rounded to two decimal places.

$$x(2x - 7) = 6$$

6. If a company has total costs $C(x) = 28{,}000 + 64x + 0.2x^2$ and total revenues given by $R(x) = 618x - 1.8x^2$, find the number of units that maximizes profit and find the maximum profit.

7. Chemists use the pH of a solution to measure its acidity or basicity. The pH is given by the formula $\text{pH} = -\log[\text{H}^+]$ where the symbol $[\text{H}^+]$ stands for the concentration of hydrogen ion in moles per liter. Find the approximate pH of these.

(a) Liquid A: $[\text{H}^+] = 5.012 \times 10^{-7} = 0.0000005012$

(b) Liquid B: $[\text{H}^+] = 3.981 \times 10^{-6} = 0.000003981$

8. Solve $192 = 300 - 300e^{-0.06x}$

(Show the algebra to justify your answer. Round your answer to 3 decimal places.)

9. (a) Rewrite the expression as a sum or difference of two logarithmic functions containing no exponents or radicals.

$$\log_4 \sqrt{\frac{x}{x+81}}$$

(b) Rewrite the expression as a single logarithm.

$$8\log_5(x^2+3) + \frac{1}{2}\log_5(x^2+9)$$