

The following 14 multiple choice questions are worth 5 points each.

1. Which of the following relations are considered functions?

I. $\{(-4, -3), (2, -5), (4, 6), (-2, -3)\}$

II.
$$\begin{array}{l} 6 \longrightarrow A \\ 10 \longrightarrow B \\ 15 \longrightarrow C \\ 19 \longrightarrow D \end{array}$$

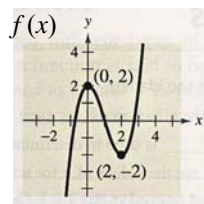
III. $y = \sqrt{x-2}$

- | | |
|--------------|----------------------|
| a. I only | d. II and III |
| b. II only | e. All are functions |
| c. I and III | |

2. Determine the domain of the function $f(x) = \frac{\sqrt{x+3}}{x-5}$.

- | | |
|------------------------------------|--|
| a. All real numbers except $x = 5$ | d. All real numbers $x \geq -3$ except $x = 5$ |
| b. All real numbers $x \geq -3$ | e. All real numbers |
| c. All real numbers $x \geq 5$ | |

3. The graph of a function f is shown below. On what interval(s) is the function increasing?



- | | |
|-------------------------------------|------------------------------------|
| a. $(-\infty, 2) \cup (-2, \infty)$ | d. $(-\infty, 0) \cup (2, \infty)$ |
| b. $(-\infty, \infty)$ | e. $(-1, 1) \cup (3, \infty)$ |
| c. $(2, \infty)$ | |

6. Determine the equation of the parabola with vertex at $(-2, 5)$ that goes through the point $(-4, -3)$.

a. $y = -\frac{1}{2}(x + 2)^2 + 5$

b. $y = -2(x + 2)^2 + 5$

c. $y = -\frac{2}{9}(x - 2)^2 + 5$

d. $y = -9(x + 2)^2 + 5$

e. None of the above

7. A textile manufacturer has daily production costs give by the function $C(x) = 10,000 - 110x + 0.045x^2$. How many units should be produced each day to yield a minimum cost? (Round your answer to the nearest integer.)

a. 57,222

b. 10,000

c. 1222

d. 55

e. None of the above

8. Polly Kost deposited \$8000 in an account that pays 6% interest, compounded annually. Polly has pledged the entire amount in this account to the Cancer Research Institute at the end of 45 years. How much money will be in the account at that time?

a. \$111,037.85

b. \$110,116.89

c. \$119,037.85

d. \$102,116.89

e. \$29,600.00

12. Use the properties of logarithms to expand the expression $\ln(x^2y^5)$ as a sum, difference, and/or multiple of logarithms.

a. $\ln x^2 \cdot \ln y^2$

d. $2 \ln x + 5 \ln y$

b. $10 \ln x \cdot \ln y$

e. $10 \ln(xy)$

c. $\frac{\ln x^2}{\ln y^5}$

13. Condense: $2 \log x - 3 \log y$

a. $\log \frac{x^2}{y^3}$

b. $\frac{\log x^2}{\log y^3}$

c. $\log(2x - 3y)$

d. $\log(x^2 - y^3)$

14. Solve: $4e^{2x} = 5$

a. $x = \frac{\ln 5}{8}$

b. $x = \frac{\ln\left(\frac{5}{4}\right)}{2 \ln}$

c. $x = \frac{\ln\left(\frac{5}{4}\right)}{2}$

d. $x = \frac{\ln 5}{\ln 8}$

e. $x = \frac{1}{2} \cdot \frac{\ln 5}{\ln 4}$

Name: _____ Section: _____

Instructor: _____

Please show all work to receive credit.

15. Algebraically find the inverse of $f(x) = (x+3)^2$, $x \geq -3$. (10 points)

16. Algebraically determine the exact solution to the equation $2 \ln 3x = 4$. Do not give a decimal approximation for x . (10 points)

Multiple Choice Key
M114 Exam 3

1. C
2. D
3. D
4. C
5. E
6. B
7. C
8. B
9. B
10. C
11. D
12. D
13. A
14. C

Name: _____ Section: _____

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15. Algebraically find the inverse of $f(x) = (x+3)^2$, $x \geq -3$. (10 points)

$$y = (x+3)^2$$

$$\frac{y = (x+3)^2}{x = (y+3)^2}$$

$$\sqrt{x} = y + 3$$

$$\sqrt{x} - 3 = y$$

$$f^{-1}(x) = \sqrt{x} - 3$$

$$\text{Dom}_f = [-3, \infty), \text{Range}_f = [0, \infty)$$

$$\text{Dom}_{f^{-1}} = [0, \infty), \text{Range}_{f^{-1}} = [-3, \infty)$$

16. Algebraically determine the exact solution to the equation $2 \ln 3x = 4$. Do not give a decimal approximation for x . (10 points)

$$2 \ln 3x = 4$$

$$\ln 3x = 2$$

$$3x = e^2$$

$$x = \frac{e^2}{3}$$

17. The following table indicates the number of accidents (per 100,000,000 km driven) for various ages (in years). (10 points)

| | | | | | | | |
|----------------|-----|-----|-----|-----|-----|-----|-----|
| Age | 20 | 30 | 35 | 45 | 55 | 65 | 75 |
| # of Accidents | 550 | 350 | 280 | 280 | 350 | 440 | 550 |

- a. Determine the quadratic regression model for this data (round to two decimal places).

$$y = 0.35x^2 - 32.01x + 1017.55$$

- b. According to the model, determine the number of accidents for a person who is 25 years old.

$$y = 0.35(25)^2 - 32.01(25) + 1017.55$$

$$y = 436.05$$

$$y \approx 436 \quad \text{or} \quad y \approx 440$$

- c. According to the model, determine the number of accidents for a person who is 40 years old.

$$y = 0.35(40)^2 - 32.01(40) + 1017.55$$

$$y = 297.15$$

$$y \approx 297 \quad \text{or} \quad y \approx 300$$

- d. According to the model, algebraically determine at what age drivers have the fewest number of accidents (round to the nearest integer).

$$x = \frac{-b}{2a} = \frac{-(-32.01)}{2(0.35)}$$

$$x = 45.72857 \dots$$

$$x \approx 46$$