

Instructor _____ Name _____
Student ID _____ ID Verification _____ Section Number _____

Time Limit: 120 minutes. All problems are worth 10 points.

No graphing calculators, notes, books, cell phones, or any devices that can connect to the Internet are allowed.

Scientific calculators with no more than a basic numeric store and recall memory are allowed on the final exam. Reference formulas that are allowed are attached to the exam.

This exam has two parts

Part I - Ten multiple choice questions - answer all

Part II - Fifteen open ended questions - answer all

INSTRUCTIONS PART I: Questions 1 - 10, Multiple Choice. Answer all TEN questions. Circle the correct answer. It is not necessary to show work. There will be no partial credit awarded on this part of the exam.

Find the domain of the function.

1) $\frac{x}{\sqrt{x-10}}$

A) all real numbers

B) $\{x \mid x \geq 10\}$

C) $\{x \mid x \neq 10\}$

D) $\{x \mid x > 10\}$

Write the exponential in logarithmic form.

2) $4^{-2} = \frac{1}{16}$

A) $\log_{1/16}(4) = -2$

B) $\log_4\left(\frac{1}{16}\right) = -2$

C) $\log_{-2}\left(\frac{1}{16}\right) = 4$

D) $\log_4(-2) = \frac{1}{16}$

Find the indicated term of the sequence.

3) The twenty-fifth term of the arithmetic sequence 0, 13, 26, ...

A) 288

B) 338

C) 325

D) 312

Compute AB, if possible.

4) $A = \begin{bmatrix} 1 & 3 & -1 \\ 3 & 0 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 0 \\ -1 & 1 \\ 0 & 3 \end{bmatrix}$.

A)

$$\begin{bmatrix} 0 & 0 \\ 9 & 9 \end{bmatrix}$$

B) Not possible

C)

$$\begin{bmatrix} 3 & 3 & 0 \\ 0 & 0 & 9 \end{bmatrix}$$

D)

$$\begin{bmatrix} 0 & 0 \\ 9 & -9 \end{bmatrix}$$

Solve the problem.

5) Find the 5th term of the geometric sequence with first term 3 and common ratio -3.

A) 27

B) 243

C) 729

D) -45

Use synthetic division to find the quotient and remainder.

6) $(3x^5 + 4x^4 + 2x^2 - 1) \div (x + 2)$

A) $3x^4 - 2x^3 + 6x^2 - 12 + \frac{23}{x + 2}$

B) $3x^4 + 2x^3 + 4x^2 + 8x - \frac{15}{x + 2}$

C) $3x^4 - 2x^3 + 4x^2 + 6 - \frac{13}{x + 2}$

D) $3x^4 - 2x^3 + 4x^2 - 6x + 12 - \frac{25}{x + 2}$

Expand the expression using the Binomial Theorem.

7) $(2x + y)^6$

A) $2x^6 + 12x^5y + 30x^4y^2 + 40x^3y^3 + 12xy^5 + y^6$

B) $64x^6 + 192x^5y + 240x^4y^2 + 160x^3y^3 + 60x^2y^4 + 12xy^5 + y^6$

C) $64x^6 + 192x^5y + 480x^4y^2 + 960x^3y^3 + 1440x^2y^4 + 12xy^5 + y^6$

D) $64x^6 + 192x^5y + 240x^4y^2 + 160x^3y^3 + 240x^2y^4 + 192xy^5 + 64y^6$

For the given functions f and g, find the requested composite function.

8) $f(x) = 8x + 12$, $g(x) = 4x - 1$; Find $(f \circ g)(x)$.

A) $32x + 11$

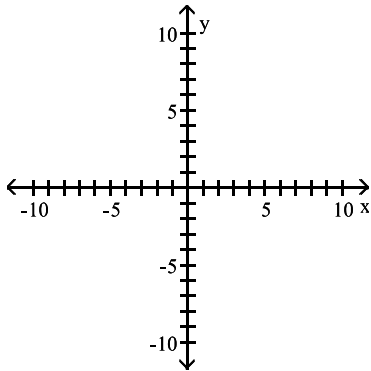
B) $32x + 4$

C) $32x + 20$

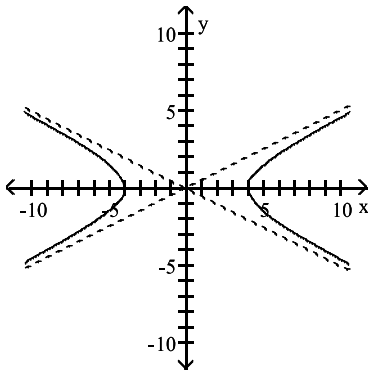
D) $32x + 47$

Graph the hyperbola.

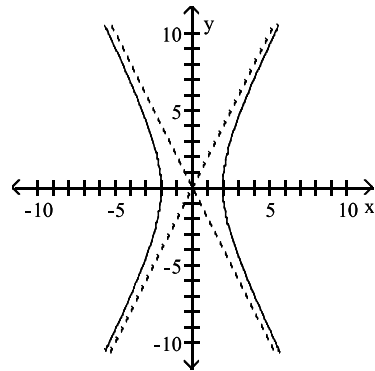
$$9) \frac{x^2}{4} - \frac{y^2}{16} = 1$$



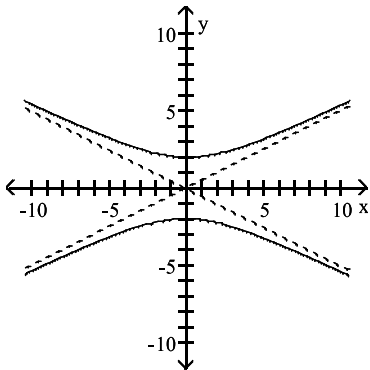
A)



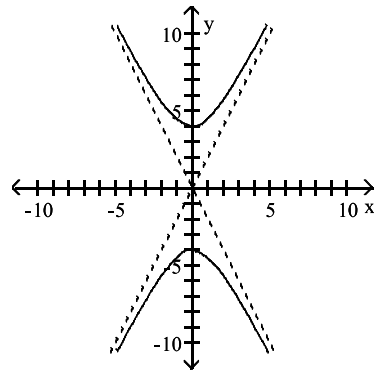
B)



C)



D)



Form a polynomial $f(x)$ with real coefficients having the given degree and zeros.

10) Degree: 3; zeros: -2 and $3 + i$.

A) $f(x) = x^3 - 6x^2 - 10x + 20$

B) $f(x) = x^3 - 8x^2 + 2x + 20$

C) $f(x) = x^3 - 4x^2 - 10x + 20$

D) $f(x) = x^3 - 4x^2 - 2x + 20$

Find the inverse of the function.

$$11) f(x) = \frac{8}{x-9}$$

Find an equation for the ellipse described.

$$12) \text{Focus at } (0, -5); \text{ vertices at } (0, \pm 7)$$

Solve the inequality.

$$13) \frac{15}{x-4} > \frac{12}{x+1}$$

Solve the equations.

$$14) 3^{(6-3x)} = \frac{1}{27}$$

$$15) \log(5 + x) - \log(x - 3) = \log 5$$

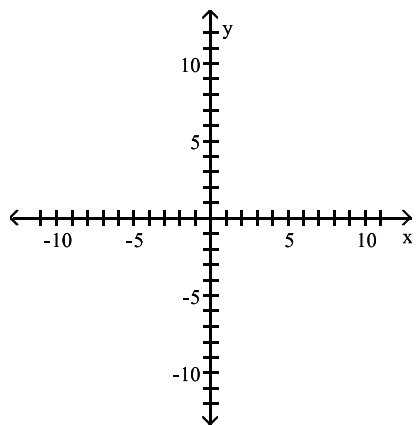
Find all zeros of the function and write the polynomial in factored form (as a product of linear factors).

$$16) f(x) = x^4 + 3x^3 + 6x^2 + 12x + 8$$

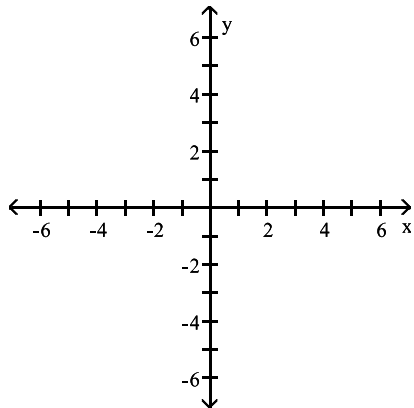
Graph the function.

17)

$$f(x) = \begin{cases} x + 3 & \text{if } -9 \leq x < 4 \\ -7 & \text{if } x = 4 \\ -x + 7 & \text{if } x > 4 \end{cases}$$

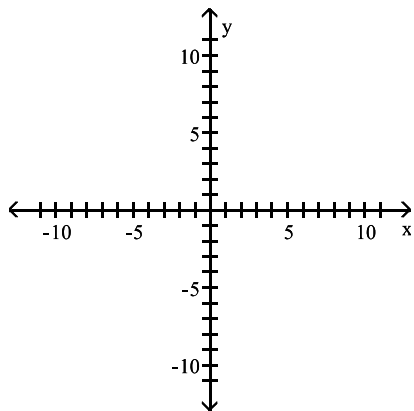


$$18) f(x) = \frac{x^2 - 2x - 15}{(x - 3)^2}$$



Graph the function and label its vertex, axis of symmetry, and intercepts.

$$19) f(x) = x^2 - 4x - 5$$



Solve the problem.

- 20) Assume that the half-life of Carbon-14 is 5700 years. Find the age (to the nearest year) of a wooden axe in which the amount of Carbon-14 is 30% of what it originally had.

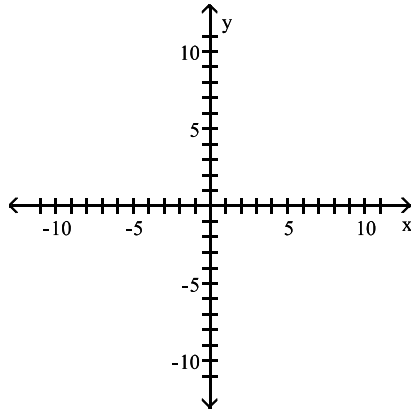
- 21) You have 64 feet of fencing to enclose a rectangular plot that borders on a river. If you do not fence the side along the river, find the length and width of the plot that will maximize the area.

Write the partial fraction decomposition of the rational expression.

22) $\frac{2x - 5}{x^2 - 5x - 6}$

Graph the function by starting with the graph of the basic function and then using the techniques of shifting, compressing, stretching, and/or reflecting.

23) $f(x) = \sqrt{x + 4} - 7$



Find the inverse matrix of A.

24) $A = \begin{bmatrix} -5 & 6 \\ 0 & 4 \end{bmatrix}$

USING MATRICES (row operations), solve the system of equations . If the system has no solution, say that it is inconsistent.

25) $\begin{cases} 2x + 3y = -1 \\ 3x + 7y = 6 \end{cases}$