MATH 1314 FINAL REVIEW PROBLEMS

These exercises represent a compilation of typical problems in this course. This is NOT a sample of the final exam. However, doing these problems will help you to prepare for the final exam. If you need help working any of the problems, you can ask your instructor, or go to the tutoring lab.

Solve the equation.

1) $2x^2 + 10x = -1$

Solve the equation.

2) $\dfrac{3x + 2}{x - 2} + \dfrac{1}{x} = \dfrac{-2}{x^2 - 2x}$

3) $x^{2/3} - 6x^{1/3} + 5 = 0$

4) $3 + \sqrt{x + 3} = x$

Solve the inequality.

5) $x^2 + 5x \geq -6$

6) $\dfrac{x - 7}{x + 8} \leq 0$

Solve the absolute value equation.

7) $2\left|\, 8m + 1 \,\right| + 7 = 17$

Solve the absolute value inequality.

8) $\left|\dfrac{2x - 9}{3}\right| > 5$

Solve the absolute value inequality.

9) $\left|\, x - 1 \,\right| - 5 \leq 4$

Find the distance between the points, and find the midpoint of the line segment joining them.

10) $(1, -1)$ and $(-2, 8)$

Find the center–radius form of the equation of the circle described.

11) Center at $(0, -4)$, radius $\sqrt{15}$

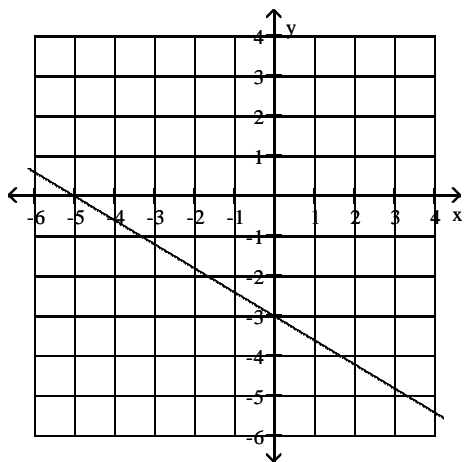**Find the function value.**

12) Find $f(x + 1)$ when $f(x) = 7x^2 - 3x$.

Find the domain and the range.

13) $f(x) = \sqrt{4 + x}$

Find the slope of the line. Give the equation of the line in slope–intercept form.

14)

Write the equation of the line in slope–intercept form.

15) Through $(-2, -1)$, perpendicular to $9x - 7y = -11$

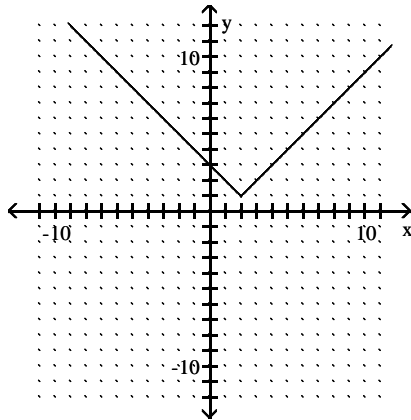**Evaluate the function at the given value of the independent variable.**

16)

$$f(x) = \begin{cases} 3x - 4, \text{ if } x \le -1 \\ x - 5, \text{ if } x > -1 \end{cases}$$

Find $f(-7)$.

Use the given graph to answer the questions.

17) a) Does the graph represent a one–to–one function?

    b) Where is the function increasing? Where is it decreasing?

    c) Give the correct equation for the graph.

    d) Give the domain and range of the function.

Sketch the graph.

18) $g(x) = -\sqrt{x + 3} - 2.$

Determine whether the function is even, odd, or neither. Describe the type of symmetry that the graph possesses.

19) $f(x) = -8x^3 + 4x$

Find the value.

20) $f(x) = x - 6, \ g(x) = -5x^2 + 11x + 3$

    Find $(fg)(3)$.

Find the composite function.

21) $(f \circ g)(x): \ f(x) = 2x^2 - 3x + 4, \ g(x) = 2x + 1$

Sketch the graph of the given quadratic function. Give the vertex, axis of symmetry, intercepts, maximum or minimum value, domain, and range.

22) $f(x) = -x^2 - 4x + 5$

Solve the problem.

23) Bob owns a watch repair shop. He has found that the cost of operating his shop is given by the function: $C(x) = 2x^2 - 144x + 86$, where C is the cost and x is the number of watches repaired. How many watches should be repaired to yield a minimum cost?

Divide using synthetic division.

24) $\dfrac{x^4 + 3x^3 + x^2 - 4}{x + 1}$

Give all possible rational zeros for the following polynomial.

25) $P(x) = 3x^3 + 3x^2 + 2x - 6$

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Find all rational zeros and their multiplicities. Factor the polynomial into linear factors.

26) $f(x) = x^3 - x^2 - 8x + 12$

Use Descartes' Rule of Signs to determine the possible number of positive and negative real zeros for the given function.

27) $f(x) = -2x^9 + x^5 - x^2 + 7$

Describe the end behavior (tail behavior) of the function and the behavior of the function at the x–intercepts.

28) $f(x) = -2x^3 - 8x^2 - 8x$

Find the domain of the rational function.

29) $f(x) = \dfrac{2x - 1}{4 - x^2}$

Give the equations of the vertical and horizontal or oblique (slant) asymptotes.

30) $f(x) = \dfrac{x - 1}{x^2 - 9}$

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

32) $f(x) = \dfrac{x^2 - 6x + 2}{x + 6}$

Find the equation of the inverse, if a one–to–one function.

33) $f(x) = x^3 + 1$

Solve the equation.

34) $\left(\dfrac{1}{5}\right)^{x-2} = (125)^{x+1}$

Find the value of the expression.

35) $\log_a \dfrac{1}{\sqrt[3]{a}}$

Convert to exponential form.

36) $\log_b c = a$

Expand the expression using the properties of logarithms. Assume that all variables represent positive real numbers.

37) $\log_7 \dfrac{\sqrt[6]{19}}{n^2 m}$

Condense the expression to a single logarithm whose coefficient is 1.

38) $3 \ln x - \dfrac{1}{3} \ln 8$

Solve the equation.

39) $3e^{2x + 4} = 6$

40) $\log_5 x + \log_5 (4x - 1) = 1$

Solve the system.

41) $\quad x + 8y = 32$
$\quad\; -3x + 9y = 36$

42) $8x - 6y = 1$
$\quad -16x + 12y = 1$

Find the determinant of the matrix.

43) $\begin{bmatrix} a & -8 \\ -4 & b \end{bmatrix}$

44) $\begin{bmatrix} 2 & 0 & 0 \\ 1 & -3 & 0 \\ -3 & 9 & 9 \end{bmatrix}$

Give all solutions of the systems of equations.

45) $x^2 + y^2 = 13$
$\quad x - y = 1$

46) $x^2 + 2y^2 = 25$
$\quad 3x^2 - y^2 = -9$

Perform the indicated matrix operations.

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

$\quad -2A + 4B$

Find the matrix product, if possible.

48) $\begin{bmatrix} 1 & 3 & -3 \\ 2 & 0 & 4 \end{bmatrix} \begin{bmatrix} 3 & 0 \\ -3 & 1 \\ 0 & 4 \end{bmatrix}$

1) $\left\{\dfrac{-5 \pm \sqrt{23}}{2}\right\}$

2) $\{-1\}$

3) $\{1, 125\}$

4) $\{6\}$

5) $(-\infty, -3] \cup [-2, \infty)$

6) $(-8, 7]$

7) $\left\{\dfrac{1}{2}, -\dfrac{3}{4}\right\}$

8) $(-\infty, -3) \cup (12, \infty)$

9) $[-8, 10]$

10) $3\sqrt{10}$; $\left(-\dfrac{1}{2}, \dfrac{7}{2}\right)$

11) $x^2 + (y + 4)^2 = 15$

12) $7x^2 + 11x + 4$

13) Domain $= [-4, \infty)$
    Range $= [0, \infty)$

14) Slope $= -\dfrac{3}{5}$

    $y = -\dfrac{3}{5}x - 3$

15) $y = -\dfrac{7}{9}x - \dfrac{23}{9}$
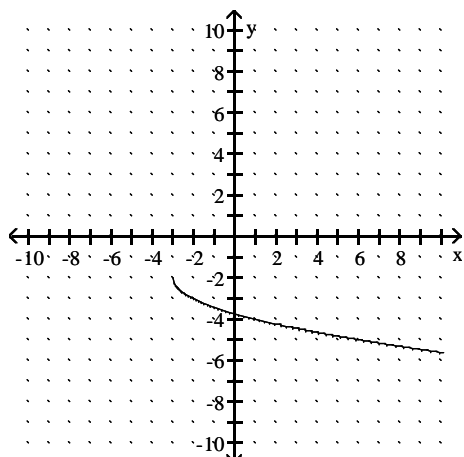
16) -25

17) a) no
    b) Increasing on $(2, \infty)$; decreasing on $(-\infty, 2)$
    c) $y = |x - 2| + 1$
    d) Domain $= (-\infty, \infty)$; Range $= [1, \infty)$

18) The graph of the basic square root funtion $f(x) = \sqrt{x}$ is translated to the left 3 units, reflected across the x–axis, and then shifted down 2 units.

19) Odd function; symmetric with respect to the origin only
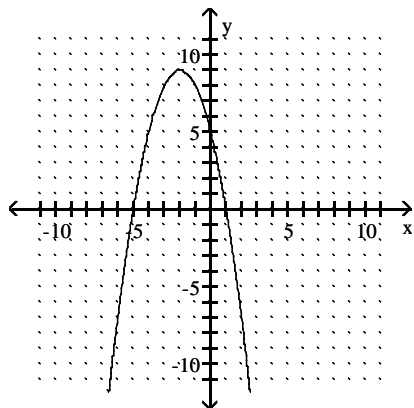20) 27
21) $(f \circ g)(x) = 8x^2 + 2x + 3$
22) Vertex $(-2, 9)$; Axis of symmetry: $x = -2$;
    x–intercepts $(-5, 0)$ and $(1, 0)$; y–intercept $(0, 5)$;
    Maximum $= 9$;
    Domain $= (-\infty, \infty)$; Range $= (-\infty, 9]$;

23) 36 watches
24) $x^3 + 2x^2 - x + 1 - \dfrac{5}{x + 1}$

25) $\pm 1, \pm 1/3, \pm 2, \pm 2/3, \pm 3, \pm 6$
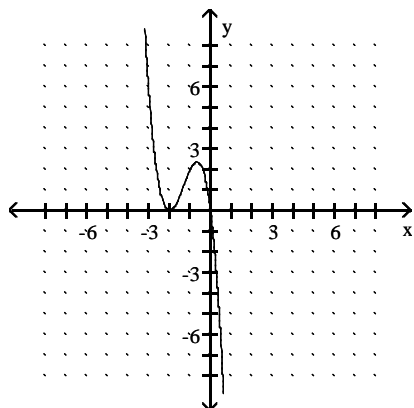26) 2 (multiplicity 2), -3 (multiplicity 1);
    $f(x) = (x - 2)^2(x + 3)$
27) 3 or 1 positive real zeros, 2 or 0 negative real zeros
28) It rises to the left and falls to the right.
    It crosses the x–axis at the x–intercept 0.
    It touches the x–axis at the x–intercept -2.

29) $(-\infty, -2) \cup (-2, 2) \cup (2, \infty)$
30) Vertical Asymptotes: $x = 3, x = -3$
    Horizontal Asymptote: $y = 0$
31) Vertical Asymptote: none
    Horizontal Asymptote: $y = 1$

32) Vertical Asymptote: $x = -6$
   No Horizontal Asymptote
   Oblique (slant) Asymptote: $y = x - 12$

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

34) $\left\{-\dfrac{1}{4}\right\}$

35) $-\dfrac{1}{3}$

36) $b^a = c$

37) $\dfrac{1}{6}\log_7 19 - 2\,\log_7 n - \log_7 m$

38) $\ln\left(\dfrac{x^3}{2}\right)$

39) $\left\{\dfrac{\ln 2 - 4}{2}\right\}$

40) $\left\{\dfrac{5}{4}\right\}$

41) $\{(0, 4)\}$

42) $\varnothing$

43) $ab - 32$

44) -54

45) $\{(-2, -3), (3, 2)\}$

46) $\left\{\left(1, 2\sqrt{3}\right), \left(1, -2\sqrt{3}\right), \left(-1, 2\sqrt{3}\right), \left(-1, -2\sqrt{3}\right)\right\}$

47) $\begin{bmatrix} -10 & -2 \\ 16 & 8 \end{bmatrix}$

48) $\begin{bmatrix} -6 & -9 \\ 6 & 16 \end{bmatrix}$