

April 7, 2000

Your name _____

The first 5 problems count 5 points each and, unless marked otherwise, rest count 6 points. The total value of the problems is 129.

1. Which of the following numbers belong to the *domain* of the function $h(x) = 2 - \sqrt{4 - x^2}$? Circle all those that apply.

(A) -2 (B) 0 (C) 2 (D) 3 (E) 5

2. Write an equation that expresses the distance d of the origin from any point of the line $y = 3x - 5$.

(A) $d = \sqrt{x^2 - 3x - 5}$ (B) $d = \sqrt{x^2 + (3x - 5)^2}$

(C) $d = \sqrt{x^2 - (3x - 5)^2}$ (D) $d = \sqrt{5 + (x - 3)^2}$

(E) $d = \sqrt{x^2 + (3x + 5)^2}$

3. What is the degree of the polynomial defined by $p(x) = (x^2 - 2)^3 \cdot (x^4 + 3)^2$?

(A) 8 (B) 10 (C) 12 (D) 14 (E) 16

4. Note that $\sqrt{2}$ is a zero of the polynomial defined by

$$p(x) = (x^2 - 2)^3 \cdot (x^4 + 3)^2.$$

What is its multiplicity?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

5. For what value of k are the lines $2x - ky = 4$ and $3x + y = 7$ perpendicular?

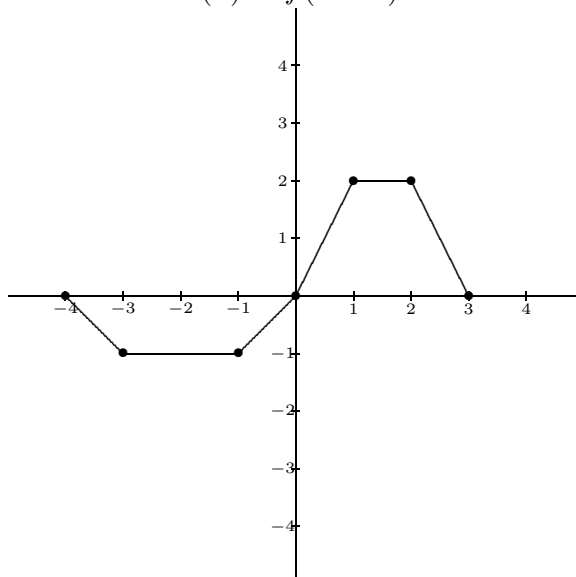
(A) -6 (B) -4 (C) 0 (D) 6 (E) 8

The next few questions are short answer questions. Write your answer in the blank provided.

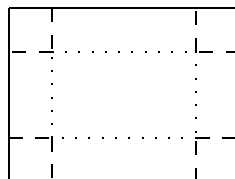
6. What is the exact value of $|7\pi - 22| + |5\pi - 15| - |7 - 2\pi|$?

7. A *median* of a triangle is a line segment connecting a vertex of the triangle with the midpoint of the side opposite the vertex. What is the length of the shortest median of the triangle with vertices $(0, 0)$, $(6, 0)$, and $(0, 8)$?

8. (10 points) Let f be the function whose graph is given below. Sketch the graph of the function h defined $h(x) = f(x - 1) - 2$.

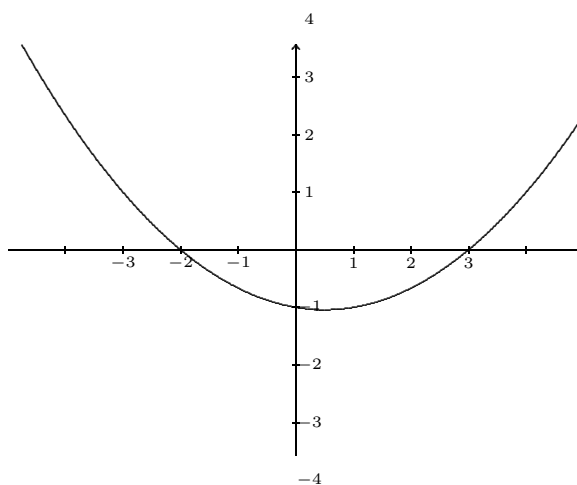


9. A topless box is built from a 12 inch by 14 inch sheet of paper by cutting from each corner a x inch by x inch square. The four squares are discarded and the flaps are folded upwards to form the sides of the box. What is the volume of the box?



10. Nick goes on a hike, leaving his home and walking 4 miles north; then he turns and walks 3 miles east, turn, and walks 5 miles south, and finally, turns again, and walks 6 miles west. How far is he from home, to the nearest tenth of a mile?

11. (10 points) Find the values of a , b , and c so that the graph of $y = ax^2 + bx + c$ is the one shown below. Note that the x -intercepts are -2 and 3 , and the y -intercept is -1 .



12. (20 points) Use “completing the square” to find the center and the radius of the circle given by

$$x^2 - 4x + y^2 + y = 2.$$

13. (20 points) Let

$$f(x) = \begin{cases} 2x - 3 & \text{if } x < -2 \\ x + 1 & \text{if } -2 \leq x \end{cases} \quad \text{and} \quad g(x) = \begin{cases} |x| & \text{if } x < 4 \\ x^2 - 3 & \text{if } x \geq 4 \end{cases}$$

(a) Find and simplify a formula for the composite function $f \circ g(x)$.

(b) Find and simplify a formula for the composite function $g \circ f(x)$.

14. (20 points) Find an equation for each of the vertical asymptotes and of the horizontal asymptote, if one exists, of the function h defined by

$$h(x) = \frac{(x^2 + 2x - 3)(x^2 - x - 6)}{(x - 3)(2x - 2)(x - 2)^2(x + 1)(x + 2)^2}.$$