

2. (20 pts) Which of the following statements are identities? Circle **T**(RUE) or **F**(ALSE) and briefly explain each FALSE answer.

**T - F** (a)  $\sin^2(x) - \cos^2(x) = \cos(2x)$

**T - F** (b)  $e^{(xy)} = e^x + e^y$ ;

**T - F** (c)  $\log(x + y) = \log(x) + \log(y)$ ,  $x > 0, y > 0$

**T - F** (d)  $\tan(x + \pi) = \tan(x)$

**T - F** (e)  $\sin(\arccos x) = \sqrt{1 + x^2}$ ,  $|x| < 1$

**T - F** (f)  $(x + yi)(x - yi) = x^2 - y^2$

3. (10 pts) If  $f(x) = \frac{2x + 1}{3x - 4}$ , what is  $f^{-1}(x)$ ?

A)  $f^{-1}(x) = \frac{4x - 1}{3x + 2}$

B)  $f^{-1}(x) = \frac{3x - 4}{2x + 1}$

C)  $f^{-1}(x) = \frac{-4x - 1}{3x - 2}$

D)  $f^{-1}(x) = \frac{5}{3x - 2}$

E)  $f^{-1}(x) = \frac{4x + 1}{3x - 2}$

4. (10 pts) A tower is 75 feet tall. What is the angle of elevation to the top from a point on the level of its base and 60 feet away from the base?
- A)  $38.66^\circ$
- B)  $0.896^\circ$
- C)  $45^\circ$
- D)  $30^\circ$
- E)  $51.34^\circ$
5. (10 pts) The graph of  $y = f(x)$  is obtained by shifting the graph of  $y = |x|$  to the right 3 units, then reflect over  $x$ -axis, and then move up 5 units. What is the formula for  $f(x)$ ?
- A)  $f(x) = -|x - 3| + 5$
- B)  $f(x) = -(|x - 3| + 5)$
- C)  $f(x) = -|x + 3| + 5$
- D)  $f(x) = -|x + 3| - 5$
- E)  $f(x) = -|3 - x| - 5$
6. (10 pts) What is the solution for the inequality  $\frac{x + 1}{x - 3} \leq 0$ ?
- A)  $(-1, 3)$
- B)  $[-1, 3)$
- C)  $[-1, 3]$
- D)  $(-\infty, -1] \cup (3, +\infty)$
- E) None of these

7. (10 pts) Given two vectors  $\mathbf{u} = \langle 1, -2 \rangle$ ,  $\mathbf{v} = \langle 2, -3 \rangle$ , which of the following is the vector  $2\mathbf{u} - \mathbf{v}$ ?
- A)  $\langle 0, 1 \rangle$
  - B)  $\langle 0, -1 \rangle$
  - C)  $\langle 4, -1 \rangle$
  - D)  $\langle 4, -7 \rangle$
  - E)  $\langle 0, -7 \rangle$
8. (10 pts) The formula  $A = Pe^{rt}$  is used to compute investment growth that is compounded continuously. If an investment takes 16 years to triple, what is the interest rate?
- A) Not enough information to find out
  - B) 0.069%
  - C) 6.500%
  - D) 6.866%
  - E) 7.107%
9. (20 pts) Find all roots, real and complex, of  $x^3 - 3x^2 + 5x - 3 = 0$ . You must show your work to receive full credit.

10. (20 pts) Find, EXACTLY, all solutions to the equation  $2 \sin(3x) = 1$ .

11. (20 pts) Find the exact functional value:

(a)  $\sin^{-1}\left(-\frac{1}{2}\right)$ ;

(b)  $\tan^{-1}(\cos \pi)$

12. (20 pts) (a) Change the complex number  $z = 1 - i$  in polar form.

(b) Use DeMoivre's Theorem to compute  $(1 - i)^{12}$  and express your answer in  $a + bi$  form.

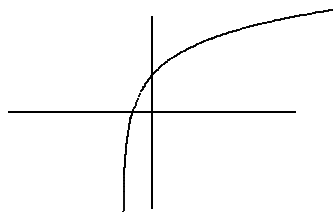
13. (20 pts) How long does it take an object to reach the ground if it is thrown downward from the top of a 780-foot building, with initial velocity of 56 feet per second?

**Note:** The position of the object above ground (in feet) after  $t$  seconds is given by  $h(t) = -16t^2 + v_0t + h_0$  where  $h_0$  is the initial position of the object at  $t = 0$ ,  $v_0$  is the initial velocity of the object at  $t = 0$ .

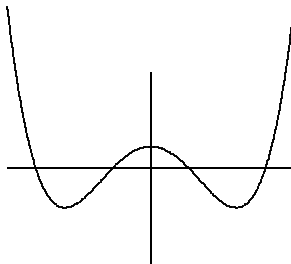
1. (20 pts) Each graph shown below is the complete graph of a function. Match each graph with the formula that best fits the function. Write the letter for the formula next to the number for the graph. Partial credit will be given for answers in the correct row.

GRAPHS:

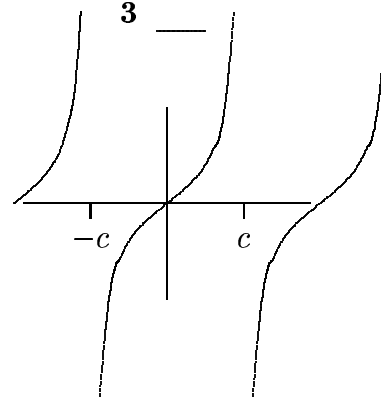
1 \_\_\_\_



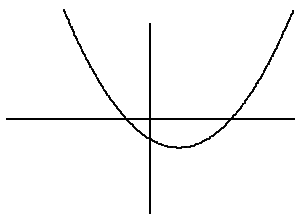
2 \_\_\_\_



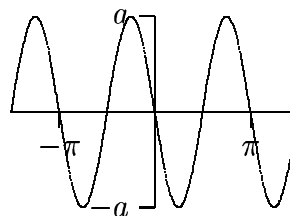
3 \_\_\_\_



4 \_\_\_\_



5 \_\_\_\_



FORMULAS:

(A)  $y = \tan(\pi cx)$

(B)  $y = \tan(\frac{1}{c}x)$

(C)  $y = \tan(\frac{\pi}{2c}x)$

(D)  $y = -a \sin(2x)$

(E)  $y = -a \sin(\frac{1}{2}x)$

(F)  $y = a \sin(2x)$

(G)  $y = (x^2 - a^2)(x^2 - b^2)$

(H)  $(x - a)^3(x - b)$

(I)  $y = -x^4 + ax^3 + bx^2 + c$

(J)  $y = (x - a)^2 + a, a > 0$

(K)  $y = (x + a)^2 - a, a > 0$

(L)  $y = 2(x - a)^2 - a, a > 0$

(M)  $y = e^{bx}, b > 0$

(N)  $y = \ln(x - b), b > 0$

(O)  $y = \ln(x + b), b > 0$