

There are 28 problems.

Problems #1–6 are Multiple Choice.

Problems #7–17 are Short Answer. (Work not required to be shown)

Problems #18–28 are Short Answer with work required to be shown.

### MULTIPLE CHOICE

1. Solve, and express **the** answer in interval notation:  $|7 - 5x| \leq 3$ . 1. \_\_\_\_\_

- A.  $[4/5, 2]$
- B.  $(-\infty, 4/5]$
- C.  $(-\infty, 4/5] \cup [2, \infty)$
- D.  $(-\infty, 2] \cup [4/5, \infty)$

2. Which of the following polynomials has a graph which exhibits the end behavior of downward to the left and upward to the right? 2. \_\_\_\_\_

- A.  $f(x) = -2x^3 + 6x^2 - x$
- B.  $f(x) = -5x^4 - 5x^3 - 1$
- C.  $f(x) = 4x^5 + 2x + 6$
- D.  $f(x) = 3x^6 + 3x^2 - x$



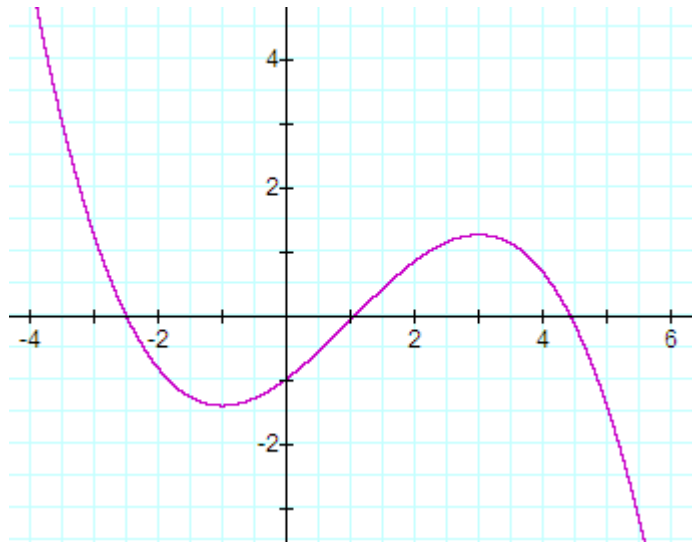
3. Express as an equivalent expression:  $9 \log x - \log(y + 3) + \log 1$  3. \_\_\_\_\_

- A.  $\log\left(\frac{9x+1}{y+3}\right)$
- B.  $\log(9x - y - 2)$
- C.  $\frac{\log x^9}{\log(y+3)}$
- D.  $\log\left(\frac{x^9}{y+3}\right)$

4. Determine the interval(s) on which the function is decreasing.

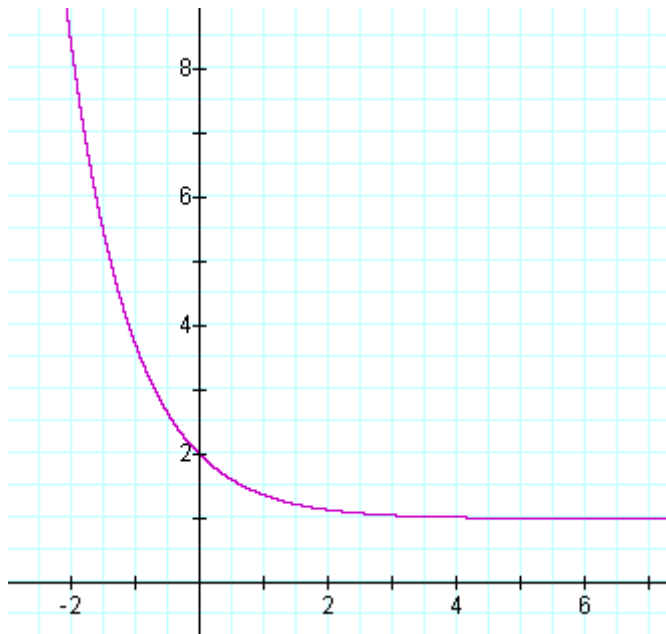
4. \_\_\_\_\_

- A.  $(-2.5, 1)$
- B.  $(-\infty, -1)$  and  $(3, \infty)$
- C.  $(-1, 3)$
- D.  $(-\infty, -2.5)$  and  $(1, 4.5)$



5. Which of the functions corresponds to the graph?

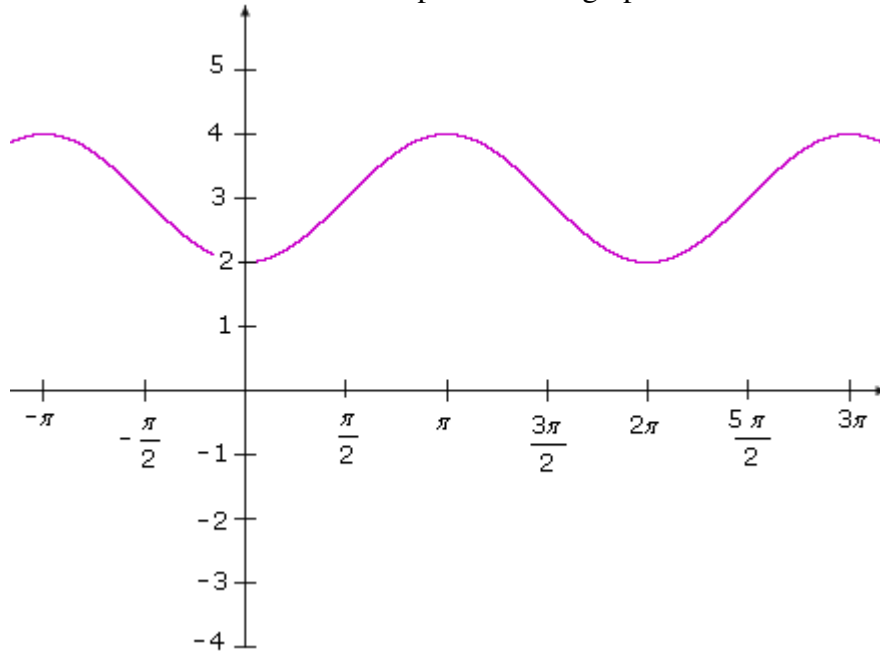
5. \_\_\_\_\_



- A.  $f(x) = e^{-x} + 2$
- B.  $f(x) = e^x + 2$
- C.  $f(x) = -e^x + 2$
- D.  $f(x) = e^{-x} + 1$

6. Which of the functions corresponds to the graph?

6. \_\_\_\_\_



- A.  $f(x) = 3 - \cos x$
- B.  $f(x) = 2 + \cos x$
- C.  $f(x) = 2(1 - \cos x)$
- D.  $f(x) = 2 - \sin x$

**SHORT ANSWER:**

7. Points  $(-6, 5)$  and  $(4, 3)$  are endpoints of the diameter of a circle.

- (a) What is the exact length of the diameter? (Simplify as much as possible)    Answer: \_\_\_\_\_
- (b) What is the center of the circle?                                    Answer: \_\_\_\_\_
- (c) What is the equation of the circle?                                    Answer: \_\_\_\_\_

8. Find the value of the logarithm:  $\log_5 \left( \frac{1}{125} \right)$ .                                    Answer: \_\_\_\_\_

9. A salesperson earns a base salary of \$1,650 per month and a commission of 8.2% on the amount of sales. If the salesperson has a paycheck of \$4,725 for one month, what was the amount of sales for the month?

Answer: \_\_\_\_\_

10. A bowl of soup at  $200^\circ$  F. is placed in a room of constant temperature of  $60^\circ$  F. The temperature  $T$  of the soup  $t$  minutes after it is placed in the room is given by

$$T(t) = 60 + 140 e^{-0.075 t}$$

Find the temperature of the soup 30 minutes after it is placed in the room. (Round to the nearest degree.)

Answer: \_\_\_\_\_

---

11. Given the function  $f(x) = 7 - \frac{1}{4}x$ , find a formula for the inverse function.

Answer: \_\_\_\_\_

---

12. (a) State the reference angle associated with  $300^\circ$ .

Answer: \_\_\_\_\_

(b) Convert  $300^\circ$  to radians. Leave the answer in terms of  $\pi$ .

Answer: \_\_\_\_\_

---

13. Given  $y = 6 \sin(8x - \pi)$ , state the

(a) period

Answer: \_\_\_\_\_

(b) phase shift

Answer: \_\_\_\_\_

---

14. Solve the trigonometric equation  $(\sin x)(2\sin x + 1) = 0$  in the interval  $[0, 360^\circ)$ .

Answer: \_\_\_\_\_

---

15. (a) Find the exact value of  $\arcsin\left(\sin\frac{3\pi}{4}\right)$

Answer: \_\_\_\_\_

(b) Find the exact value of  $\arccos\left(\sin\frac{3\pi}{2}\right)$

Answer: \_\_\_\_\_

---

16. For the parabola given by  $(x + 5)^2 = -8(y - 4)$ , find the following:

(a) direction parabola opens (to the left, right, up, or down)

Answer: \_\_\_\_\_

(b) vertex

Answer: \_\_\_\_\_

(c) focus

Answer: \_\_\_\_\_

17. Let  $f(x) = \frac{x}{x^2 - 4}$ .

(a) State the domain.

Answer: \_\_\_\_\_

(b) State the horizontal asymptote.

Answer: \_\_\_\_\_

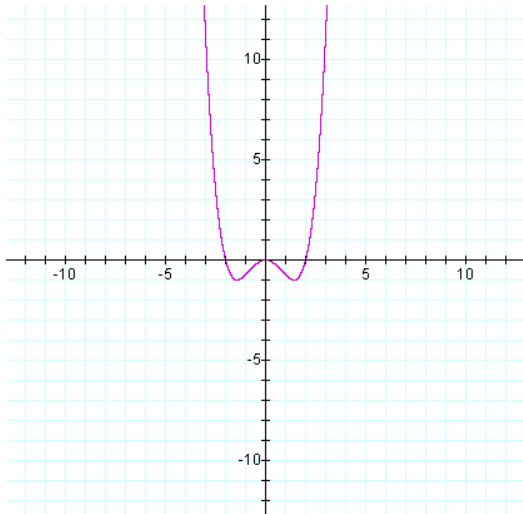
(c) State the vertical asymptote(s).

Answer: \_\_\_\_\_

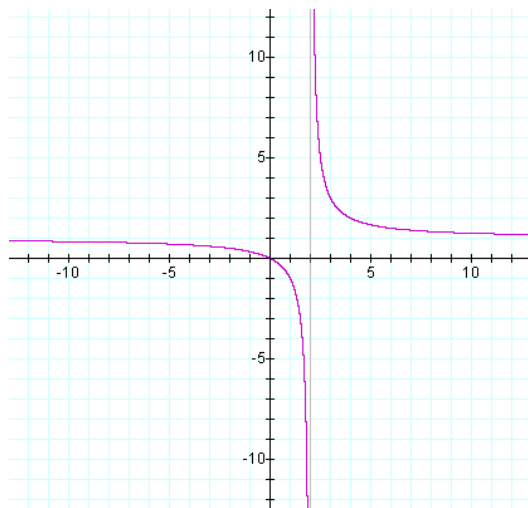
(d) Which of the following represents the graph of  $f(x) = \frac{x}{x^2 - 4}$  ?

Answer: \_\_\_\_\_

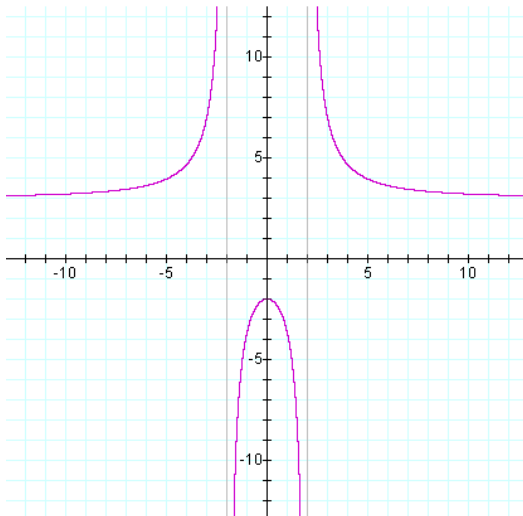
GRAPH A.



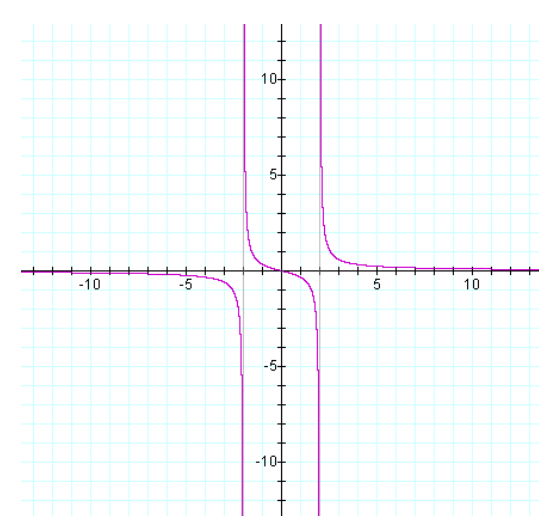
GRAPH B.



GRAPH C.



GRAPH D.



**SHORT ANSWER, with work required to be shown, as indicated.**

18. Find the equation for a line which passes through the points  $(-8, 9)$  and  $(-6, 3)$ . Write the equation in slope-intercept form. **Show work.**

---

19. Find the exact solutions and simplify as much as possible:  $5x^2 + 1 = 8x$ . **Show work.**

---

20. Let  $f(x) = 4x^2 - 6$  and  $g(x) = x - 3$ .

(a) Find the composite function  $(f \circ g)(x)$  and simplify. **Show work.**

(b) Find  $(f \circ g)(-2)$ . **Show work.**

---

21. A projectile is launched from a platform 12 feet high with an initial velocity of 80 feet per second. The height  $h$  of the projectile at  $t$  seconds after launch is given by  $h = -16t^2 + 80t + 12$  feet.

(a) How many seconds after launch does the projectile attain maximum height? **Show work.**

(b) What is the maximum height? **Show work.**

---

22. Solve:  $\frac{x+7}{x+3} + \frac{24}{x^2-9} = 0$ . **Show work.**

---

23. Suppose that  $\sin \theta = 5/13$  and that  $\theta$  is a Quadrant II angle.

(a) Find the exact value of  $\cos \theta$ . **Show work.**

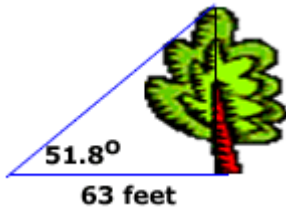
(b) Find the exact value of  $\sin 2\theta$ . **Show work.**

---

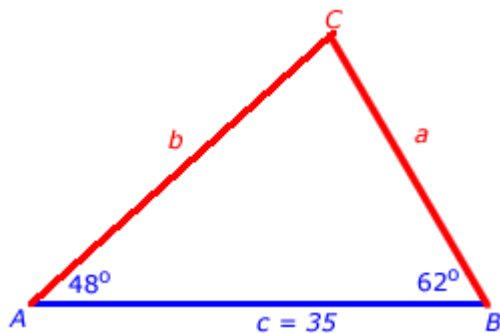
24. **Prove** the identity  $(\sin x + \cos x)^2 = 1 + \sin(2x)$

---

25. From a point 63 feet from the base of a redwood tree, the angle of elevation to the top of the tree is  $51.8^\circ$ . Find the height of the tree to the nearest foot. **Show work.**  
(sketch is not to scale)



26. For the triangle  $ABC$ , we are given that  $A = 48^\circ$ ,  $B = 62^\circ$ , and  $c = 35.0$ .



Find the length of side  $b$ , rounded to the nearest tenth. **Show work.**

27. Let  $\vec{u} = \langle 9, -3 \rangle$  and  $\vec{v} = \langle 4, 12 \rangle$ .

- (b) Calculate the dot product  $\vec{u} \cdot \vec{v}$ . **Show work.**  
(c) Determine the angle between  $\vec{u}$  and  $\vec{v}$ . Round the result to the nearest degree. **Show work.**

28. An ellipse has the equation  $\frac{(x+2)^2}{4} + \frac{(y-9)^2}{36} = 1$

- (a) Is the major axis horizontal or vertical?  
(b) Find the exact values of the foci of the ellipse. **Show work.**