

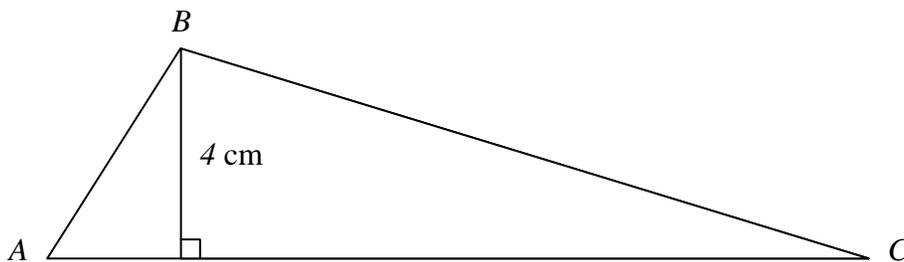
GENERAL INSTRUCTIONS: Read all instructions carefully.

1. You have 55 minutes to complete the fundamental concepts exam (FCE).
2. Early departure is authorized. Give the FCE to your instructor when completed.
3. This exam evaluates the understanding of the math concepts fundamental to each cadet at this stage of his / her academic development. This is a non-technology exam. No references of any kind may be used.
4. Including this cover page, there are seven pages (numbered one through seven) to the exam.
5. Show as much work as possible.
6. Do not write on the back of the tests pages. Use a blank continuation sheet and clearly identify that the problem is continued both on the exam and on the continuation sheet. Be sure to put your name on the continuation sheet.
7. Place your name on every exam page.

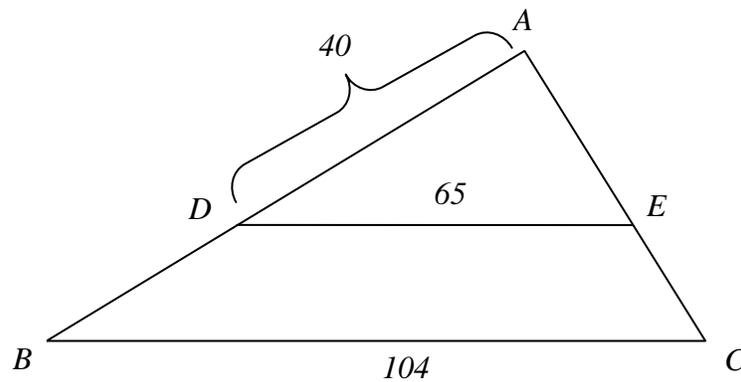
1. An angle measuring  $-28$  degrees is equivalent to how many radians?
2. Where does the graph of the function  $f(x) = x^2 + 3x - 40$  cross the  $x$ -axis?

3. Solve for **all** values of  $x$  that satisfy:  $\frac{2x-3}{x+1} = \frac{2x}{x-1}$ .

4. Given the following triangle ABC with an area of  $32 \text{ cm}^2$ , what is the length of the side AC?



5. Given that  $y = \log_4 x$ , find  $x$  when  $y = 2$ .
6. Given the relation  $P = \frac{n \cdot R \cdot T}{V}$ , what happens to  $P$  if  $V$  increases while  $n$ ,  $R$  and  $T$  stay the same?
7. Given the following triangle with side  $DE$  parallel to side  $BC$  and lengths in centimeters, what is the length of side  $DB$ ?

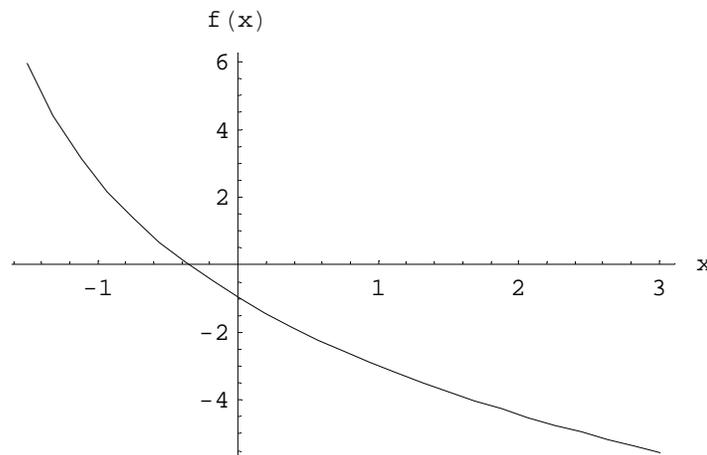


8. The diagonal of a square is 7 inches long. How long is the side of the square?

9. On a 40-mile car trip to Middletown, NY, you drive the first twenty miles at 30 miles per hour. How fast will you have to go the last twenty miles in order to arrive exactly one hour after you left?

10. Find the equation of the line perpendicular to the line  $2y = 4x + 6$  and through the point  $(-1, 4)$ .

11. Given the function shown on the graph:

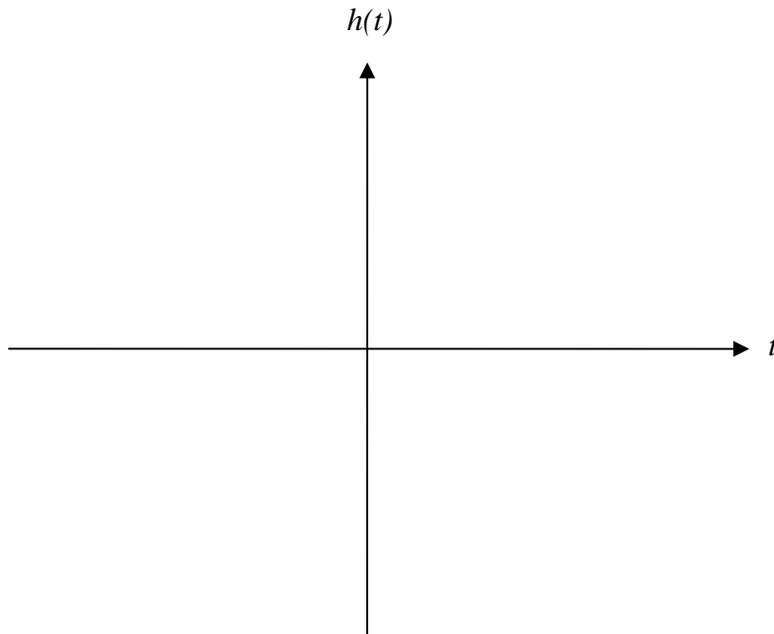


Estimate the  $x$ -value in the domain of this function that yields a function value of 2.

12. What is the range of  $f(x) = 3\sin(2x)$ ?

13. Given  $f(s) = 5 + 3s$  and  $g(t) = t^3$ , find  $f(2x^2) - g(x)$ .

14. Sketch the graph of the function:  $h(t) = (t - 2)^2 + 1$ . Identify two points on the graph.



15. Do the following lines intersect? If so, how many times and where?

Line 1:  $3y + 6x = 30$

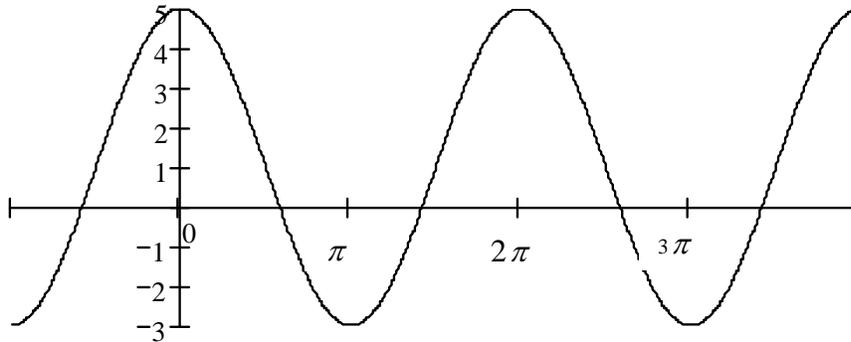
Line 2:  $6y - 15x = -48$

16. Simplify the following expression:  $\frac{4x^7y^9}{32x^2y^{12}}$

17. Solve  $x^2 - x + 3 \geq 4 - x$  for **all** values of  $x$ .

18. What happens to the function  $f(x) = \frac{1}{6x+12}$  as  $x$  gets close to -2?

19. What is the equation of the function shown below?



- a.  $4 \sin(x) + 1$     b.  $\cos(4x) + 1$     c.  $5 \sin(x)$     d.  $5 \cos(x)$     e.  $4 \cos(x) + 1$

20. What is the straight-line distance between the points  $(-1, -3)$  and  $(6, 1)$  ?