

GENERAL INSTRUCTIONS: Read all instructions carefully.

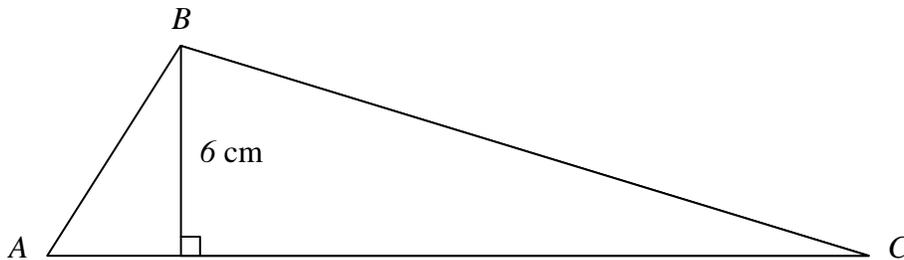
1. You have 55 minutes to complete the fundamental concepts exam (FCE).
2. Early departure is authorized. Give the FCE to your instructor when completed.
3. This exam evaluates the understanding of the math concepts fundamental to each cadet at this stage of his / her academic development. This is a 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 test 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. $\frac{3\pi}{4}$ radians is equivalent to how many degrees?

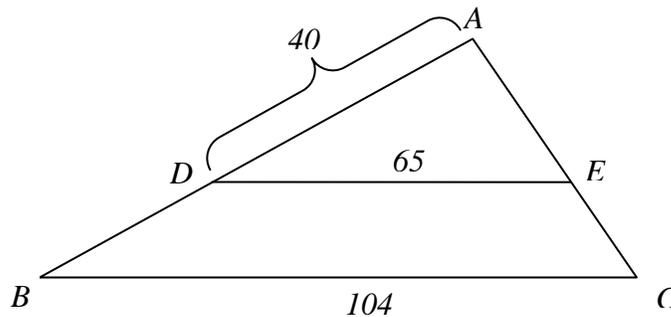
2. The diagonal of a square is 5 inches long. How long is the side of the square?

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

4. Given the following triangle ABC with an area of 30 cm^2 , what is the length of the side AC?



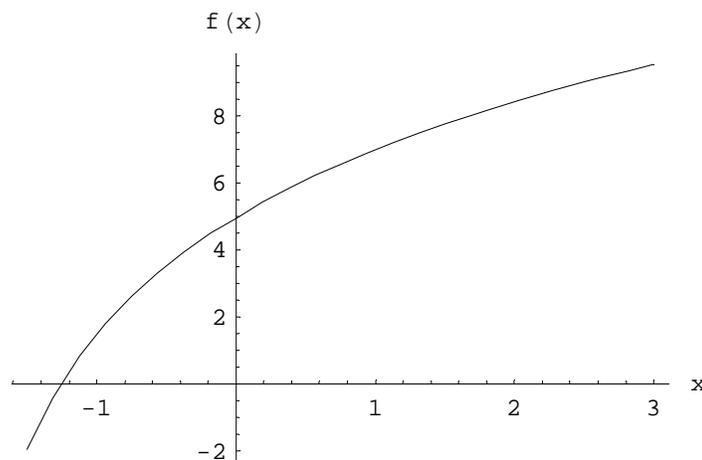
5. Given that $y = \log_3 x$, find x when $y = 2$.
6. Given the relation $P = \frac{n \cdot R \cdot T}{V}$, what happens to P if V increases while n , R and T stay the same?
7. Given the following triangle with side DE parallel to side BC and lengths in centimeters, what is the length of side DB ?



8. Two patrols depart from the same point at the same time. One patrol travels south at 4 miles per hour and the other travels east at 3 miles per hour. Assuming the patrols walk in a straight line, find the distance between the patrols 10 hours later.

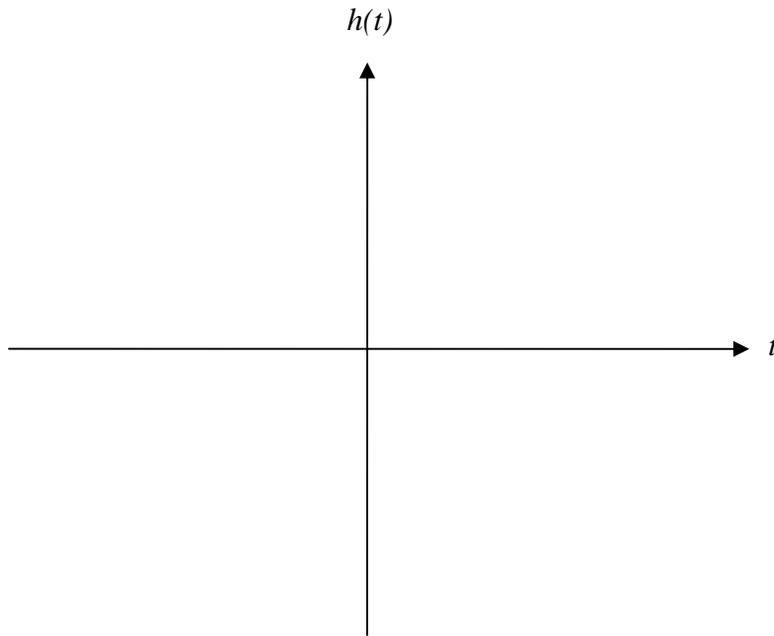
9. Find the equation of the line perpendicular to the line $4y = 6x + 3$ and through the point $(2,7)$.

10. Given the function shown on the graph:



Estimate the y-value in the range of this function that yields a domain value of 2.

11. Sketch the graph of the function: $h(t) = 3t^2 - 2$. Identify two points on the graph.



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

Line 1: $3y + 4x = 11$

Line 2: $-y + 15x = -20$

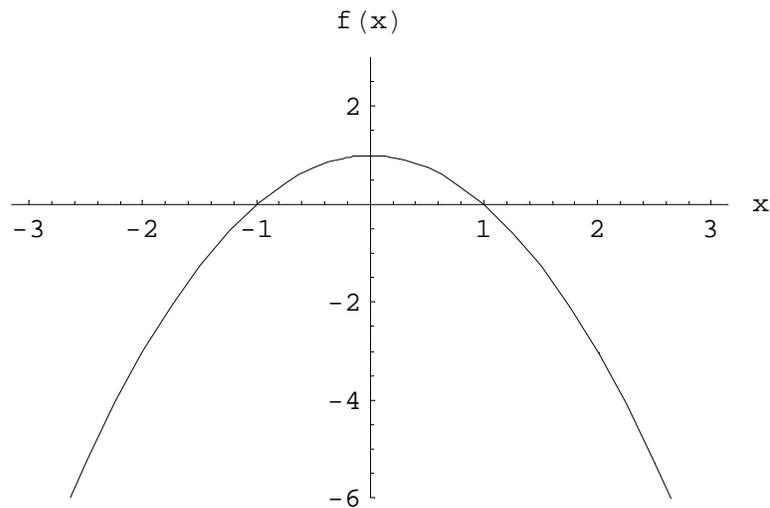
13. What is the range of $f(x) = 3\cos(2x)$?

14. Given $g(t) = 6 + 2t$ and $h(s) = 4s^3$, find $g(2b) + h(-1)$.

15. Simplify the following expression: $\frac{8x^3y^8}{32xy^9}$

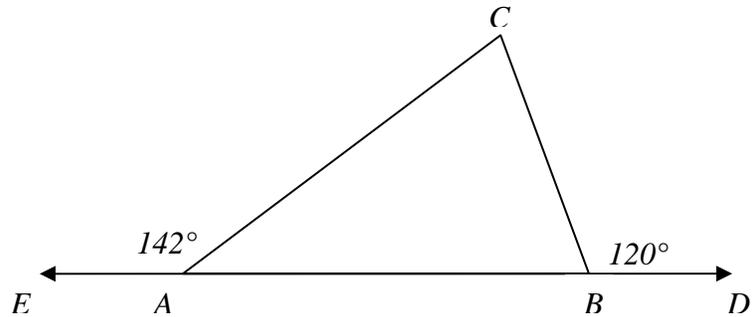
16. Solve $x^2 - x + 3 \geq 4 - x$ for **all** values of x .

17. What is an equation for the function shown below?



- a) $f(x) = x^3 + 1$ b) $f(x) = x^2 - 1$ c) $f(x) = 1 - x^2$ d) $f(x) = (1 - x)^2$ e) $f(x) = -x^4 - 1$

18. In the diagram below, what is the angle BCA ?



19. What happens to the function $f(x) = \frac{1}{2x-8}$ as x gets close to 4?

20. Where does the graph of the function $f(x) = x^2 + 5x - 36$ cross the x -axis?