Cadet_____ Section_____

FCE Version 4– MA103 50 Points

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.

FOR MORE SPACE USE AN EXTRA SHEET

Sheet No. 2 22 September 2005

Cadet_____ Section_____

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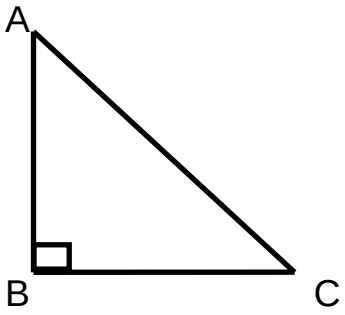
1. A continuous line passes through points (1,0) and (3,5). Similarly, a line is drawn through the points (-2,3) and (0,8). Do these lines intersect? Why?

These lines do not intersect. They have the same slope and do not share any common points, therefore they are parallel.

2. In the diagram below, side AC has a length of 25, side BC has a length of 15. What is the length of side AB?

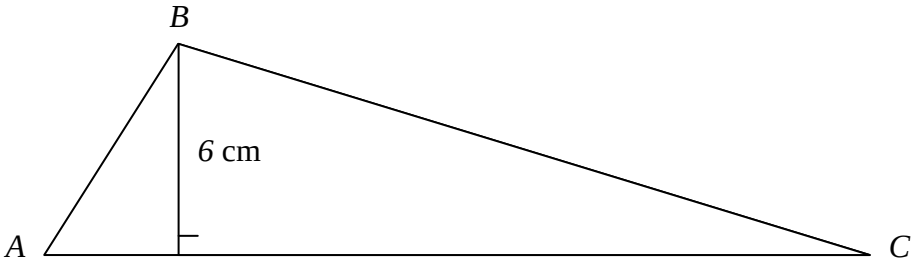


$\overline{AB} = 20$

3. What is the straight line distance between (3, -2) and (6, 1)?

$distance = 3\sqrt{2}$

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



$\overline{AC} = 10\ cm$

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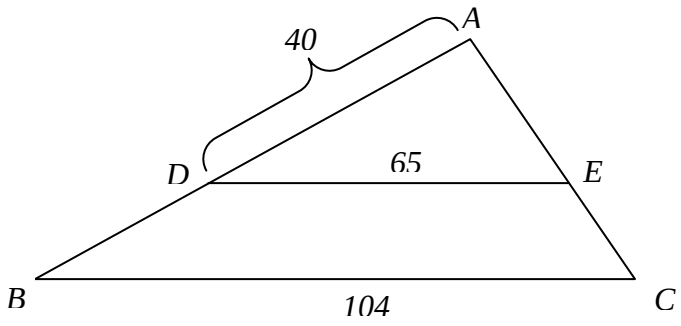
5. Given that $y = \log_3 x$, find x when y = 2.

$x = 9$

6. Given the relation $P = \dfrac{n \cdot R \cdot T}{V}$, what happens to V if P increases while n, R and T stay the same?

V decreases proportionally with an increase to P.

7. Given the following triangle with side DE parallel to side BC and lengths in centimeters, what is the length of side DB?



$\overline{DB} = 24\ cm$

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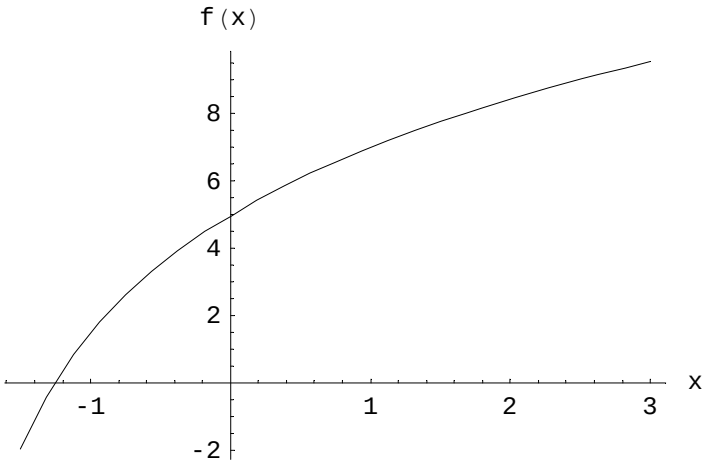
8. Solve for x when, $\dfrac{2}{\frac{x}{4}+3}=6$

$$x=-\frac{32}{3}$$

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

$$y-7=-\frac{2}{3}(x-2)$$

10. Given the function shown on the graph:



Estimate the function value given a domain value of 2.

$$f(x)\approx 8$$

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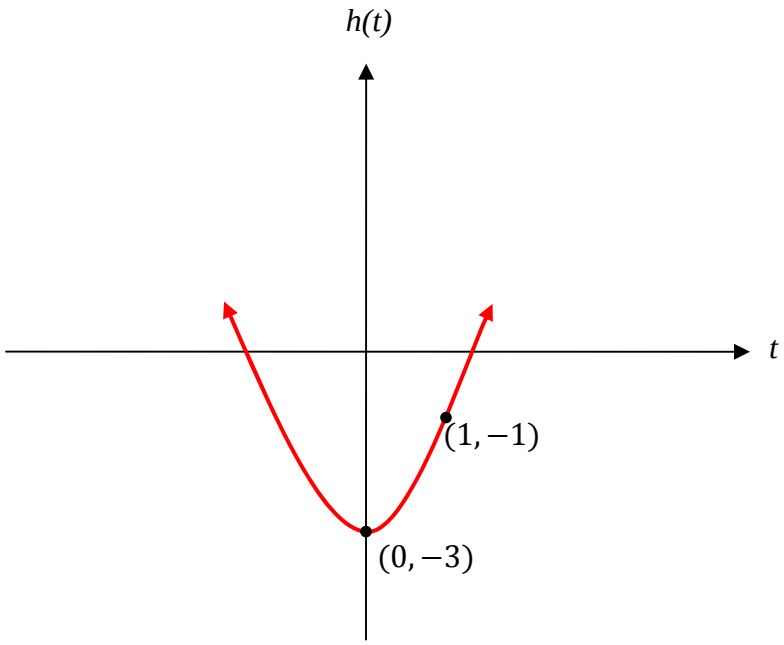
11. Sketch the graph of the function: $h(t) = 2t^2 - 3$. Identify two points on the graph.



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

$$\begin{Bmatrix} 8x + 2y = -3 \\ 6x + 2y = 4 \end{Bmatrix}$$

Yes, once at $\left(-\frac{7}{2}, \frac{25}{2}\right)$.

13. Given the function $f(x) = 3\cos(2x)$, what is the smallest value f(x) can have?

the smallest value for $f(x)$ ***is*** -3

14. If $t(x) = x^2 - 16$, for what values of x does $t(x) = 0$?

$x = \pm 4$

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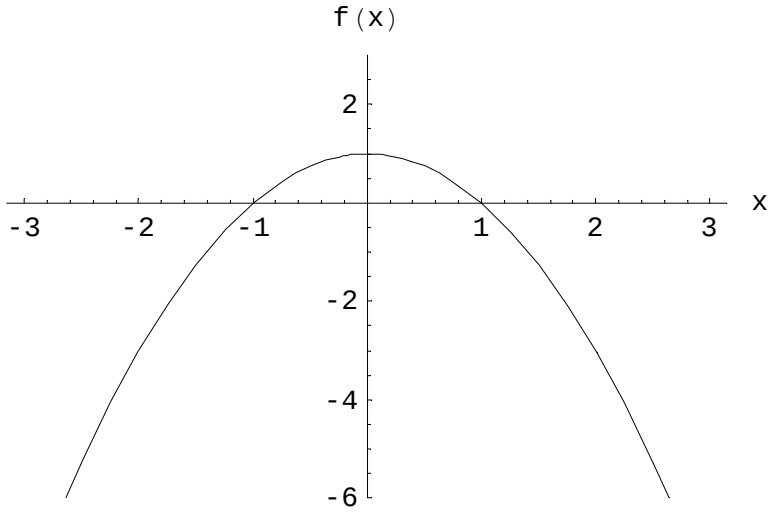
15. Simplify the following expression: $\left(\dfrac{-3x^{\frac{1}{3}}y}{y^{\frac{1}{4}}}\right)^3$.

$$-27xy^{9/4}$$

16. Find the domain of the real valued function $y = \dfrac{x}{\sqrt{x-9}}$.

$$\textbf{Domain}: \{x | x > 9\}$$

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) $f(x) = -x^4 - 1$

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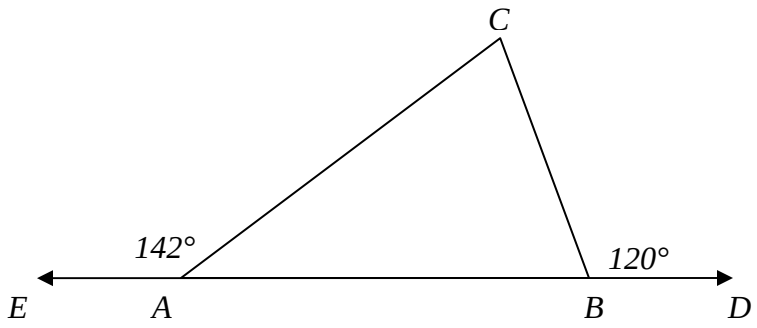
18. In the diagram below, what is the angle *BCA*?



$\angle BCA = 82°$

19. What happens to the function $h(v) = \dfrac{1}{v+1}$ as v gets close to 0?

as v approaches **0**, $h(v)$ *approaches* **1**.

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

at $x = -9$ *and* **4**

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