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 five pages (numbered one through five) to the exam.

5. Show as much work as possible.

6. If you need more room, 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

1. What is the Tan($45°$)?

<center>**1**</center>

2. A continuous line passes through points (5,4) and (1,2). Similarly a line is drawn
    through the points (1,3) and (-1,2). Do these lines intersect? Why?

<center>*No, these lines have the smae slope but do not share any of the
same points, therefore they are parallel and do not intersect.*</center>

3. The diagonal of a square is 4 inches long. What is the area of the square?

<center>$A = 8\ inches^2$</center>

4. Solve for x in the equation e^x = 80

<center>$x = \ln 80$</center>

<center>**FOR MORE SPACE USE AN EXTRA SHEET**</center>

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5. The volume of a rectangular box with a base of 8 inches by 4 inches is 96 cubic inches. How tall is the box?

$$h = 3\ inches$$

6. Simplify the following function
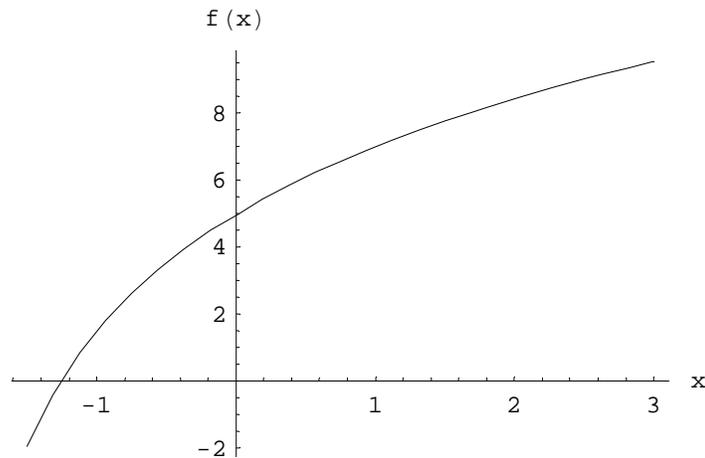$$\sqrt{49b^6} + \sqrt{\frac{b^4}{4a^2}}$$

$$7b^3 + \frac{b^2}{2a}$$

7. Given the following rectangle, the length of side CD and the length of the diagonal BC in centimeters, what is the area of the triangle CDB? *(Note: Diagram is not to scale)*

$$A = 96\ cm^2$$

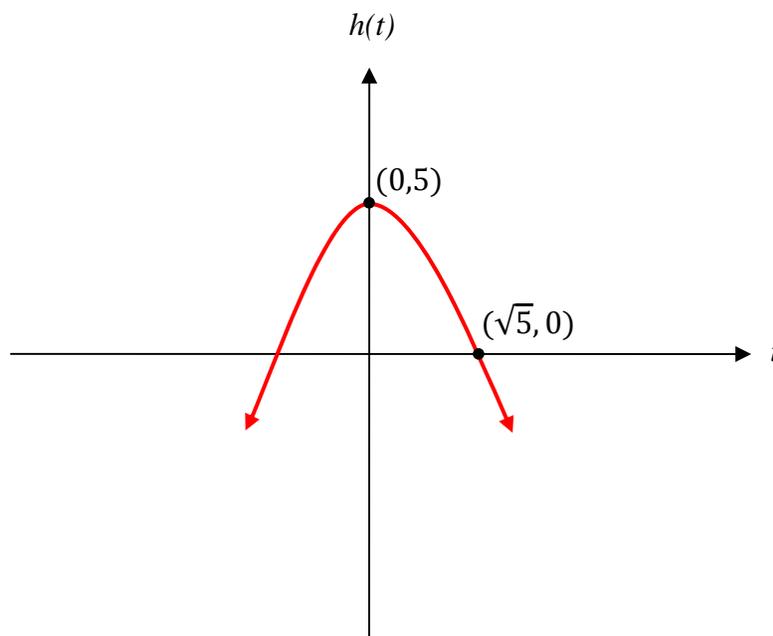**FOR MORE SPACE USE AN EXTRA SHEET**
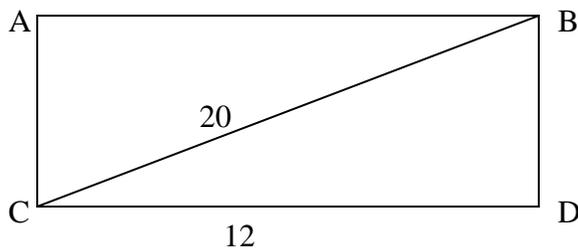
8. Given the function shown on the graph:

f(x)

Estimate the functional value that is yielded with domain value of 0.

$$f(x) \approx 5$$

9. Sketch the graph of the function: $h(t) = 5 - t^2$. Identify two points on the graph.

h(t)

(0,5)

$(\sqrt{5}, 0)$

t

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10. Do the following lines intersect? If so, how many times and where?
$$y = 2x + 5$$
$$y = 5x - 16$$

$$\textit{Yes, once at } (\mathbf{7, 19})$$

11. Solve 4(2-*x*) > 3(2-2*x*) for *x*.

$$\boldsymbol{x > -1}$$

12. Given $p(y) = 3y^2 - y + 6$ find $p(2z)$.

$$\boldsymbol{p(2z) = 12z^2 - 2z + 6}$$

13. Solve the system $y = 3 - x^2$ and $y = 2 + 2x^2 - 2x$ for all values of x.

$$\boldsymbol{x = 1, y = 2 \text{ and } x = -\frac{1}{3}, y = \frac{26}{9}}$$

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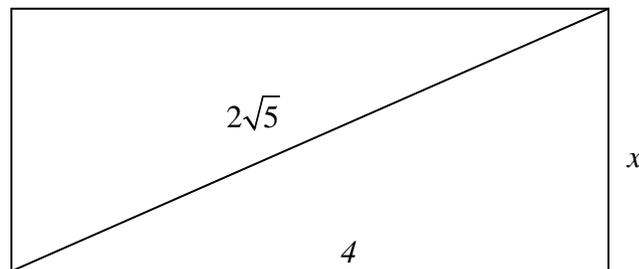14. Identify a function that decreases as x goes to infinity.

$$f(x) = -x^2$$

15. Given $g(t) = 6t - 2$ and $h(s) = 5s^3$, find $g(a) + h(1)$.

$$g(a) + h(1) = 6a + 3$$

16. Solve for **all** values of x that satisfy: $x^2 = (2x - 5)(x + 1) - x$.
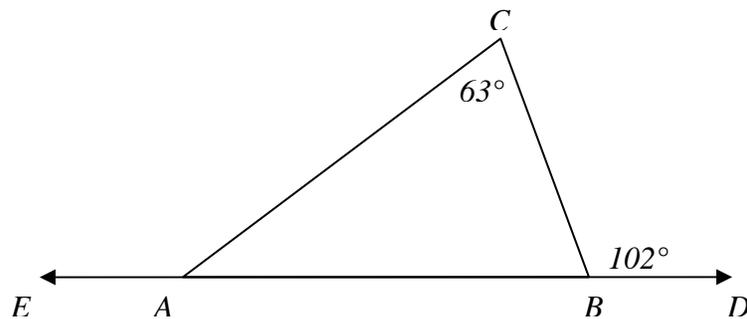
$$x = -1 \; and \; 5$$

17. Find x:

$$x = 2$$

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

$$\boldsymbol{y - 2 = -\frac{1}{3}(x + 2)}$$

19. In the diagram below, what is the angle *EAC*?

$$\boldsymbol{\angle EAC = 141°}$$

20. Where does the graph of the function $f(x) = x^2 + 3x - 18$ cross the x-axis?

$$\boldsymbol{at\ x = -6\ and\ 3}$$

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