Sheet No. 1 | 8 September 2005

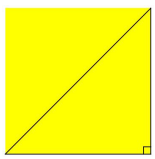
Name: _____ | Section: _____

FCE Version 1 - MA 103 | 50 points

1. An angle measuring 62 degrees is equivalent to how many radians?

$$\frac{\text{degrees}}{360} = \frac{\text{radians}}{2\pi}$$
$$\frac{62}{360} = \frac{x}{2\pi}$$
$$124\pi = 360x$$
$$\boxed{x = \frac{124\pi}{360} = \frac{31\pi}{90}}$$

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



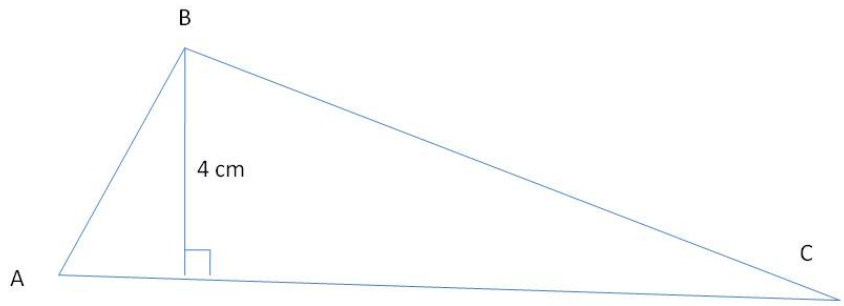
Using Pythagorean Theorem,

$$x^2 + x^2 = 5^2$$
$$2x^2 = 25$$
$$x^2 = \frac{25}{2}$$
$$\boxed{x = \sqrt{\frac{25}{2}}}$$

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

$$x \neq -2 \text{ and } x \neq 0$$
$$x(x-1) = (x+2)(x+3)$$
$$x^2 - x = x^2 + 5x + 6$$
$$0 = 6x + 6$$
$$\boxed{\text{x=-1}}$$

4. Given the following triangle ABC with an area of 28 cm^2, what is the length of the side AC?



$$A = \frac{1}{2} b \cdot h$$
$$28 = \frac{1}{2} b \cdot 4$$
$$\boxed{b = AC = 14\text{cm}}$$

FOR MORE SPACE USE AN EXTRA SHEET

5. Given that $y = \log_2 x$, find x when $y = 3$.

$$3 = \log_2 x$$

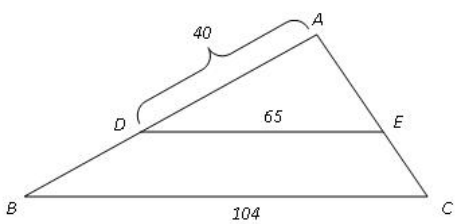
$$x = 2^3$$

$$\boxed{x = 8}$$

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

P will decrease proportional to the increase in V.

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



Let the length of BD be x.

$$\frac{40}{40 + x} = \frac{65}{104}$$

$$104(40) = 65(x + 40)$$

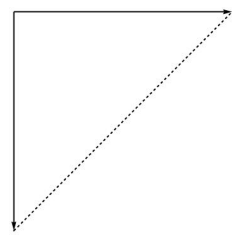
$$4160 = 65x + 2600$$

$$65x = 1560$$

$$\boxed{x = 24 \text{ cm}}$$

FOR MORE SPACE USE AN EXTRA SHEET

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.



The south bound patrol-person will have traveled 40 miles in 10 hours.

The east bound patrol-person will have traveled 30 miles in 10 hours.

Using the Pythagorean Theorem:

$$40^2 + 30^2 = \text{distance apart}^2$$

$$\boxed{\text{distance apart=50 miles}}$$

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

$$y = \frac{3}{2}x + \frac{3}{4}$$

The slope of the line perpendicular is $\frac{-2}{3}$.

$$y = \frac{-2}{3}x + b$$

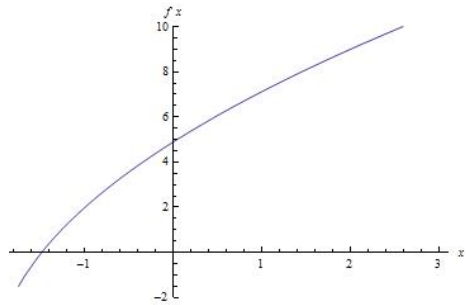
$$7 = \frac{-2}{3}2 + b$$

$$7 = \frac{-4}{3} + b$$

$$b = \frac{25}{3}$$

$$\boxed{y = \frac{-2}{3}x + \frac{25}{3}}$$

10. Given the function shown on the graph:



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

$$\boxed{x = -1}$$

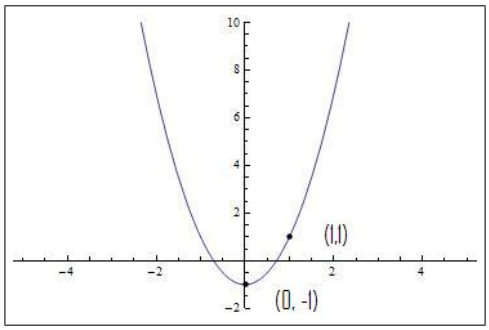
FOR MORE SPACE USE AN EXTRA SHEET

Sheet No. 4 | 8 September 2005

Name: _____ | Section: _____

FCE Version 1 - MA 103 | 50 points

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



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

$$\text{Line 1: } 3y + 6x = 30$$
$$\text{Line 2: } 6y - 15x = -48$$

Yes they intersect, because the two lines do not have the same slope.

$$-2(3y + 6x = 30)$$
$$6y - 15x = -48$$
$$-27x = -108$$
$$x = 4$$
$$3y + 6(4) = 30$$
$$3y = 6$$
$$y = 2$$
$$\boxed{\text{They intersect at } (4, 2).}$$

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

The range is $\boxed{-2 \leq y \leq 2}$ because the amplitude was doubled.

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

$$g(1) + h(2b)$$
$$(6 + 2(1)) + (4(2b)^2)$$
$$8 + 4(4b^2)$$
$$\boxed{8 + 16b^2}$$

FOR MORE SPACE USE AN EXTRA SHEET

Sheet No. 5 | 8 September 2005

Name: _____ | Section: _____

FCE Version 1 - MA 103 | 50 points

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

$$\frac{8x^3y^8}{32xy^9}$$

$$\frac{1x^{3-1}y^{8-9}}{4}$$

$$\frac{x^2y^{-1}}{4}$$

$$\boxed{\frac{x^2}{4y}}$$

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

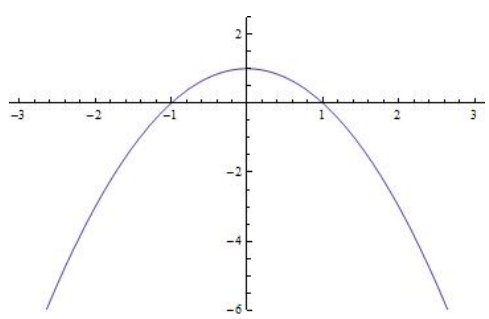
$$x^2 - 1 \geq 0$$

$$x^2 \geq 1$$

Since $x^2 = 1$ at $x = 1$ and $x = -1$, we see that

$$\boxed{x \leq -1 \text{ or } x \geq 1}$$

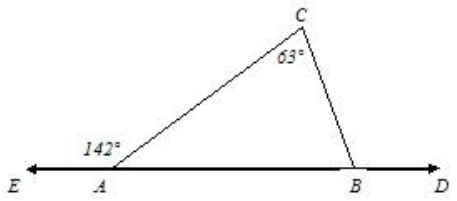
17. What is an equation for the function shown below?



a) $f(x) = x^3 + 1$ b) $f(x) = x^2 - 1$ $\boxed{\text{c) } f(x) = 1 - x^2}$ d) $f(x) = (1 - x)^2$ e) $f(x) = -x^4 - 1$

FOR MORE SPACE USE AN EXTRA SHEET

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



$$\text{Angle CAB} = 180^\circ - 142^\circ = 38^\circ$$
$$\text{Angle CBA} = 180^\circ - (63^\circ + 38^\circ) = 180^\circ - 101^\circ = 79^\circ$$
$$\boxed{\text{Angle CBD} = 180^\circ - 79^\circ = 101^\circ}$$

19. What happens to the function $f(x) = \dfrac{1}{4x - 12}$ as x gets close to 3?

$\boxed{\text{As values of } x \text{ get close to 3, but are slightly larger than 3, then } f(x) \text{ goes off to infinity.}}$

$\boxed{\text{As values of } x \text{ get close to 3, but are slightly less than 3, then } f(x) \text{ goes off to negative infinity.}}$

20. Where does the graph of the function $f(x) = x^2 + 3x - 40$ cross the x-axis?

$$x^2 + 3x - 40 = 0$$
$$(x + 8)(x - 5) = 0$$
$$\boxed{x = -8,\ x = 5}$$

FOR MORE SPACE USE AN EXTRA SHEET