

**CMIS 160 – Discrete Mathematics for Computing  
Readiness Test Solutions – 15 May 2005**

Q1. What is the value of  $(-3)(-5) - (2)(-7)$ ?

Solution:  $(-3)(-5) - (2)(-7) = 15 - (-14) = 15 + 14 = 29$

Q2. What is the product of  $|4|$  times  $|-8|$ ?

Solution:  $|4| \cdot |-8| = 4 \cdot 8 = 32$

Q3. What is the value of  $2\frac{3}{5} + 1\frac{5}{7}$  ?

Solution:

$$2\frac{3}{5} + 1\frac{5}{7} = \left(\frac{10}{5} + \frac{3}{5}\right) + \left(\frac{7}{7} + \frac{5}{7}\right) = \frac{13}{5} + \frac{12}{7} = \frac{13 \cdot 7}{5 \cdot 7} + \frac{12 \cdot 5}{7 \cdot 5} = \frac{91 + 60}{35} = \frac{151}{35} = 4\frac{11}{35}$$

Q4. What is the value of  $\sqrt{16}$  ?

Solution: 4, because  $4^2 = 4 \cdot 4 = 16$ .

Q5. Which of the following is equal to  $x^7 x^3$  ?

- a.  $x^{21}$
- b.  $x^{73}$
- c.  $x^{10}$
- d.  $x^4$

Solution:  $x^7 x^3 = x^{7+3} = x^{10}$ . This is answer (c).

Q6. Which of the following is equal to  $(a^4)^3$  ?

- a.  $a^7$
- b.  $a$
- c.  $a^{12}$
- d.  $a^{43}$

Solution:  $(a^4)^3 = a^{4 \cdot 3} = a^{12}$ . This is answer (c).

Q7. Perform the indicated operation and simplify:  $(8x - 5y)(2x + 3y)$

Solution:  $(8x - 5y)(2x + 3y) = (8x)(2x) + (8x)(3y) + (-5y)(2x) + (-5y)(3y)$   
 $= 16x^2 + 24xy - 10xy - 15y^2$   
 $= 16x^2 + 14xy - 15y^2$

Q8. Perform the indicated operation and simplify:  $\frac{x-y}{z} + \frac{x}{x+y}$

$$\text{Solution: } \frac{x-y}{z} + \frac{x}{x+y} = \frac{(x-y)(x+y)}{z(x+y)} + \frac{zx}{z(x+y)} = \frac{x^2 - y^2 + zx}{zx + zy}$$

Q9. Solve the equation  $y = \frac{x}{x+2}$  for the variable  $x$ .

Solution: First, multiply both sides of this equation by  $x+2$ :

$$y(x+2) = \frac{x}{x+2}(x+2)$$

Simplify this to:

$$xy + 2y = x$$

Collect all the terms containing  $x$  on one side:

$$2y = x - xy = x(1-y)$$

Divide both sides by  $1-y$ :

$$x = \frac{2y}{1-y}$$

Q10. If  $x = -1$ , what is the value of the expression

$$24x^4 - 16x^3 + 17x^2 + 10x - 20 \quad ?$$

$$\begin{aligned} \text{Solution: } & 24(-1)^4 - 16(-1)^3 + 17(-1)^2 + 10(-1) - 20 \\ & = 24(1) - 16(-1) + 17(1) + 10(-1) - 20 \\ & = 24 + 16 + 17 - 10 - 20 = 27 \end{aligned}$$

Q11. If the function  $f$  is defined for all real numbers  $x$  by  $f(x) = \frac{x+1}{x^2+1}$ , compute the numerical value  $f(f(-1))$ .

Solution: This is done in two steps.

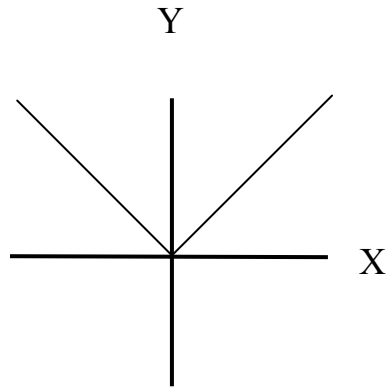
$$\text{Step 1: } f(-1) = \frac{-1+1}{(-1)^2+1} = \frac{0}{2} = 0$$

$$\text{Step 2: } f(f(-1)) = f(0) = \frac{0+1}{0^2+1} = \frac{1}{1} = 1$$

Q12. What is the value of the expression  $\frac{2n+1}{n+1}$  if  $n$  is replaced by  $n+1$ ? Simplify your answer as much as possible.

$$\text{Solution: } \frac{2(n+1)+1}{(n+1)+1} = \frac{2n+2+1}{n+2} = \frac{2n+3}{n+2}$$

Q13. Consider the following graph of a function of a real variable:



Of which of the following functions is this the graph?

- a.  $f(x) = x$
- b.  $g(x) = x^2$
- c.  $h(x) = |x|$
- d.  $k(x) = 1/x$

Solution: (c). This is the graph of the “absolute value” function.

Q14. Which of the following has the same meaning as  $\log_2(a) = b$  ?

- a.  $2^a = b$
- b.  $2^b = a$
- c.  $a^2 = b$
- d.  $a^b = 2$

Solution: (b). This is in fact the *definition* of the  $\log_2$  function.