2210 Discrete Structures Prerequisite Quiz

Name and Id: .....

1. Identify the five components e, π, i, 1, and 0 that appear in the famous formula: $\mathbf{e^{\pi i} + 1 = 0}$.
   (a) The additive identity: _____
   (b) The multiplicative identity: _____
   (c) The ratio of a circle's circumference to its diameter: _____
   (d) The base of the natural logarithm: _____
   (e) The square root of -1: _____

2. Order the following five numbers in an increasing order: $\mathbf{e}, \sqrt{\mathbf{2}}, \mathbf{1}, \pi, \mathbf{0}$

   ___ < ___ < ___ < ___ < ___

3. (a) Evaluate: $3 + 3 \times 3 =$ _____
   (b) Evaluate: $4 \div 4 \div 4 =$ _____

4. (a) Expand $(x + y)^2 =$ _____
   (b) Expand $(x - y)^2 =$ _____
   (c) Factor $x^2 - y^2 =$ _____

5. (a) Simplify $x^n \times x^m =$ _____
   (b) Simplify $x^n \times y^n =$ _____
   (c) If $\log_a(y) = x$, then $a^x =$ _____
   (d) If $\log_a(x) + \log_a(y) = \log_a(z)$, then $z =$ _____

6. (a) $4! =$ _____
   (b) Simplify $\frac{(n+1)!}{n!} =$ _____

7. (a) Solve the following two linear equations. Find the values of x and y.

$$\begin{aligned} x + y &= 20 \\ 2x - 3y &= 5 \end{aligned}$$

   $x =$ _____ $y =$ _____

   (b) What are the two roots of the quadratic equation $\mathbf{x^2 - 2x - 15 = 0}$?

   $x_1 =$ _____ $x_2 =$ _____

8. When a fair coin is flipped, then both the probabilities of Heads (H) and Tails (T) are 1/2. Three fair coins are flipped. What is the probability that

   (a) all the coins show H: _____

   (b) exactly one coin shows H while the other two coins show T: _____

9. (a) Let T be a right-angled triangle with sides a, b, and c where c is the hypotenuse (the side opposite the right angle). Write c as a function of a and b.

   _____

   (b) What is the sum of the degrees of all the inner angles of the following geometric shapes?

      i. Triangle: _____

      ii. Square: _____

   (c) Let C be a circle whose radius is r.

      i. What is the circumference of C as a function of r? _____

      ii. What is the area of C as a function of r? _____

10. What is the value of c when each procedure terminates?

   (a) $f(n)$ (* $n > 0$ is an integer number *)
   $c = 0$
   for $i = 1$ **to** n **do**
   for $j = 1$ **to** n **do**
   $c := c + 1$
   $c =$ _____

   (b) $f(n)$ (* $n > 0$ is an integer number *)
   $c = 1$
   for $i = 1$ **to** n **do**
   $c := c * 2$
   $c =$ _____

11. Order the following functions from the slowest to the fastest when n tends to infinity:

$$n^2 \;;\; \log(n) \;;\; n \;;\; 2^n$$

$$\_\_\_\_ < \_\_\_\_ < \_\_\_\_ < \_\_\_\_$$