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| **SESSION** | **APRIL 2025** |
| **PROGRAM** | **Bachelor of CoMPUTER APPLICATIONS (BCA)** |
| **SEMESTER** | **I** |
| **course CODE & NAME** | **DCA1105 Fundamentals of Mathematics**  |
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 **SET-I**

**Q1. Write the composite function** $f(g\left(x\right))$ **if**

1. $f\left(x\right)=x^{2}$ **and** $g\left(x\right)=2x+1,$
2. $f\left(x\right)=x+1$ **and** $g\left(x\right)=x^{3}+\sin(x)$**.**

### **Ans 1.**

### **Composite Functions**

#### **(a)** Given:

* $f(x)=x^{2}$
* $g(x)=2x+1$

We are asked to find: $f(g(x))$ This means substitute $g(x)$ into $f(x)$.

**Solution:**

$$f(g(x))=f(2x+1)=(2x+1)^{2}$$

Now expand:

$$(2x+1)^{2}=4x^{2}+4x+1$$

**Ans:**

$$f(g(x))=4x^{2}+4x+1$$

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**Q2. Evaluate the followings:**

**(i)** $\lim\_{n⟶\infty }\frac{3n^{2}+4n+7}{2+3n+4n^{2}}$ **(ii)** $\lim\_{x⟶2}\frac{x^{2}-3x+2}{x-2}$

### **Ans 2.**

### **Limits**

#### **(i)**

Evaluate:

$$\lim\_{n\to \infty }\frac{3n^{2}+4n+7}{2+3n+4n^{2}}$$

**Step-by-step:**

* Identify the highest power of $n$ in both numerator and denominator: $n^{2}$
* Divide numerator and denominator by $n^{2}$

$$=\lim\_{n\to \infty }\frac{3+\frac{4}{n}+\frac{7}{n^{2}}}{\frac{2}{n^{2}}+\frac{3}{n}+4}$$

**Q3. Find the value of** $\cos(75)$ **and** $\tan(15)$**.**

### **Ans 3.**

####  **(a)** $cos75^{∘}$

We can write:

$$cos75^{∘}=cos(45^{∘}+30^{∘})$$

**Use identity:**

$$cos(A+B)=cosAcosB-sinAsinB$$

Let $A=45^{∘}$, $B=30^{∘}$:

$$cos75^{∘}=cos45^{∘}cos30^{∘}-sin45^{∘}sin30^{∘}$$

### **SET-II**

**Q4. Decompose** $\frac{x^{2}+x+1}{ (x-1)(x+2)} $**into partial fraction.**

### **Ans 4.**

### **Decompose into Partial Fractions:**

Given:

$$\frac{x^{2}+x+1}{(x-1)(x+2)}$$

We want to write:

$$\frac{x^{2}+x+1}{(x-1)(x+2)}=\frac{A}{x-1}+\frac{B}{x+2}$$

**Step 1: Combine the RHS**

$$\frac{A}{x-1}+\frac{B}{x+2}=\frac{A(x+2)+B(x-1)}{(x-1)(x+2)}$$

**Q5. Consider the function** $f(x)=x^{3}-3x^{2}+2$**. Determine where the function is increasing or decreasing.**

## **Ans 5.**

## **Determine where the function is increasing or decreasing**

Given function:

$$f(x)=x^{3}-3x^{2}+2$$

### **Step 1: Find the first derivative**

To determine where the function is increasing or decreasing, we use the first derivative test:

$$f^{'}(x)=\frac{d}{dx}(x^{3}-3x^{2}+2)=3x^{2}-6x$$

**Q6. Determine the value of the following logarithms:**

 **(i)** $log\_{25}5$ **(ii)** $log\_{7}$**1**

**Ans 6.**

### **(i)** $log\_{25}5$

We want to evaluate:

$$log\_{25}5=x⇒25^{x}=5$$

Write 25 as $5^{2}$:

$$(5^{2})^{x}=5⇒5^{2x}=5^{1}$$