# BAL BHARATI PUBLIC SCHOOL, DWARKA

## HOLIDAY HOMEWORK (2023-24)

### CLASS XII

## INDEX

- ➢ Psychology
- ➢ Economics
- ➢ English
- ➢ Physics
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- ➢ Chemistry
- ➢ Computer Science
- ➢ Mathematics

# PSYCHOLOGY

Q1. Develop a case profile of an individual exhibiting any of the following:

    a.) Is a prodigy and is exhibiting superior/ability in any of the domain (sports, music, academics etc.)

    b.) Requires career counselling

    c.) Has a dysfunctional family.

    d.) Has any of the following difficulties- learning disability, ADHD, speech delays, physical ailment which is impairing everyday functioning.

Q2. Give critical reviews of any movie/book that is depicting a psychological disorder. (15 Park Avenue, Black Swan, Sybil, Joker etc.)

Q3. Prepare a research paper on the topic "Intelligence is an interplay of nature and nurture".

    (500-600 words)

# ECONOMICS

**Student should choose any one topic as suggested by CBSE and submit the first draft**

**(handwritten or typed) :**

☐ Introduction (Two pages)

☐ Meaning and definition with suitable examples (One page)

☐ Research articles on the topic (8 – 10 articles with facts, figures, graphs, pictures and

   cartoons relevant to the topic)

☐ Source of information

**CBSE Guidelines for Project Work in Economics**

• Students are supposed to pick any ONE of the two suggested projects.


**I. Project (Option One) : What's Going Around Us**

The purpose of this project is to study the scope and repercussions of various Economic events and happenings taking place around the country and the world. (eg. The Dynamics of the Goods &Services Tax and likely impacts on the Indian Economy or the Economics behind the Demonetisation of 500 and 1000 Rupee Notes and the Short Run and Long Run impact on the Indian Economy or The impact of BREXIT from the European Union etc.)

Scope of the project: Student may work upon the following lines:

• Introduction

• Details of the topic

• Pros and Cons of the economic event/happening

• Major criticism related to the topic (if any)

• Students' own views / perception / opinion and learning from the work

• Any other valid idea as per the perceived notion of the student who is actually working and

presenting the Project-Work.

Marking Scheme: Marks are suggested to be given as –

S. No  Heading MarksAllotted

1. Relevance of the topic 3

2. Knowledge Content/Research Work 6

3. Presentation Technique 3

4. Viva 8

Total 20 Marks

Suggested List

1. Disinvestment policy

2. Demonetisation

3. Goods and Services Tax Act

4. Inflation

5. Any other topic

**II. Project (Option Two): Analyse any concept from the syllabus**

The purpose of this project is to –

• Understand the concepts of Economic theory and application of the concept to the real life

situations.

Scope of the project:

Following essentials are required to be fulfilled in the project.

Explanation of the concept:

- Meaning and Definition

- Application of the concept

- Diagrammatic Explanation (if any)

- Numerical Explanation related to the concept etc. (if any)

- Students' own views/perception/ opinion and learning from the topic.

# ENGLISH

**PROJECT WORK**

1. ASL PROJECT:Students shall be required to prepare a project (a survey/podcast/review/role play) and write a report, in accordance with the guidelines provided by CBSE.

**ASSIGNMENT**

2. Create a portfolio of your writings based on the guidelines given below:
   a. **Invitation Writing**– You are the President of the Residents Welfare Association of Rose Valley Apartments. Your society has organised a vaccination program for the residents as well as workers of the society, along with their families. Draft a formal invitation providing all the necessary details.
   b. **Letter to the Editor** - You are Amrit/Amritha of Bangalore. You are disturbed at the non-availability of essential commodities in the Fair Price Shops of your area. Write a letter to the Editor of The Hindu drawing the attention of the authorities to the irregularities in the Fair Price Shops and the steps that can be undertaken to check them.
   c. **Article** – Digital payment is bound to replace banking system in the coming decade. Write an article on the given topic in 150-200 words.

3. Watch any one of the following movies and pen down a review concentrating on the plot, historical/political background, characterization, and theme in not more than 200 words.
   a. Midnight in Paris (2011)
   b. The Shawshank Redemption (1994)
   c. In This Corner of the World (2016)
   d. Gandhi (1982)
   e. The Theory of Everything (2014)
   f. Independence Day (1996)
   g. Mission Impossible III (2006)

# PHYSICS

Prepare an Investigatory Project on any one of the following topics or any other topic of your choice based on concept of Physics (as per CBSE guidelines).

**POINTERS FOR MAKING PROJECT REPORT**

The material should be placed and bound in the following order:

**1. Top Sheet of transparent plastic** –The top page of your report should carry the following information in printed form or handwritten in neat block letters:

Title of Project:
Name of Student:
Roll Number:


**2. Aim of Project**

**3. Apparatus Required**

**4. Principle/Theory**

**5. Construction with Labeled Diagram**

**6. Working**

**7. Observations**

**8. Calculations**

**9. Result/ Conclusions**

**10. Applications / Future scope**

**11. Graph if any**

**12. References/Bibliography**

**13. Back cover** of **plastic: may be opaque or transparent**


## List of Investigatory Projects

1. Verification of Kirchhoff Laws and Ohms Law
2. Variable Resistors: Potentiometer, Preset & LDR: Sequential glowing of LEDs,    Internal structure of potentiometer/preset, Working of LDR
3. Capacitors-Charging and Discharging With Resistors & Time Constants
4. Relay & Electromagnetism- Burglar Alarm, Alternate Switching, Oscillator
5. Diode- VI Characteristics & Working, Low Resistance Path, Protection Device
6. OR and AND Digital Logic Gates using Diodes

7. NOR and NAND Digital Logic Gates using Diodes
8. Zener Diode- Working & Reverse Breakdown Voltage, Voltage Regulator
9. Touch Activated Switch (Passing current through body) using a Transistor
10. Darlington Pair (Multi-stage amplifier using transistors)
11. Automatic Night Lamp using transistor and LDR
12. LED Blinker (or Flasher) using a Transistor
13. H-Bridge (Motor-driving circuit used in robotics) using transistors
14. DC Motor: Studying relation between RPM and Voltage
15. Wheatstone Bridge: Calculating the unknown resistance using two fixed resistors and a variable resistor (potentiometer)
16. Full-wave Bridge Rectifier (Using diodes and a 12V AC transformer)
17. Full-wave rectifier using diodes and a center-tapped 12V AC transformer
18. Joule Thief: Drawing energy from a dead cell using an inductor
19. IR (Infrared) Security or Intrusion Alarm System
20. Temperature Sensor using a thermistor

# BIOLOGY

Prepare one Investigatory Project on any one of the following topic or any other topic of your choice.

POINTERS FOR MAKING PROJECT REPORT

The material should be placed and bound in the following order:

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1. Top Sheet of transparent plastic –The top page of your report should carry the following information in printed form or handwritten in neat block letters:

Title of Project:

Name of Student:

Roll Number:

2. Aim of Project

3. Materials required

4. Principle/theory

5. Observations and observation table

6. Result/ Conclusions

7. AIM OF SURVEY

8. Survey questionnaire (to be conducted on group pf at least 25 people)

9. Survey analysis

10. Survey conclusion

11. References/bibliography

TOPICS FOR THE PROJECT:

1. Calculating TLC and DLC in a diseased and a healthy individual and preparing a comparative account of the same.

2. Study of quantity of casein present in different samples of milk.

3. Preparation of soybean milk and its comparison with the natural milk with respect to curd formation, effect of temperature, etc.

4. Study of the effect of Potassium Bisulphate as food preservative under various conditions (temperature, concentration, time, etc.)

5. Study of digestion of starch by salivary amylase and effect of pH and temperature on it.

6. Comparative study of the rate of fermentation of following materials: wheat flour, gram flour, potato juice, carrot juice, etc.

7. Extraction of essential oils present in Saunf (aniseed), Ajwain (carum), Illaichi (cardamom).

8. Study of common food adulterants in fat, oil, butter, sugar, turmeric power, chilli powder and pepper.

9. Extraction of DNA from different plant sources and performing gel electrophoresis to compare their molecular weight.

10. Testing the hardness, presence of Iron, Fluoride, Chloride, etc., depending upon the regional variation in drinking water and study of causes of presence of these ions above permissible limit (if any).

11. Investigation of the foaming capacity of different washing soaps and the effect of addition of Sodium Carbonate on it.

12. Study the acidity of different samples of tea leaves.

13. Performing paper chromatography of different amino acids

14. Testing the blood groups of people in population and identifying the most common blood group in the same.

15. Study of acidity of fruit and vegetable juices.

# <u>CHEMISTRY</u>

Prepare one Investigatory Project on any one of the following topic or any other topic of your choice based on concept of Chemistry (as per CBSE guidelines).

## POINTERS FOR MAKING PROJECT REPORT

The material should be placed and bound in the following order:

**1. Top Sheet of transparent plastic** –The top page of your report should carry the following information in printed form or handwritten in neat block letters:

Title of Project:
Name of Student:
Roll Number:

**2.  Acknowledgement**(as per CBSE guidelines)

**3.  Certificate** (as per CBSE guidelines)

**4. Aim of Project**

**5. Apparatus required to perform the project**

**6. Principle/theory of the project**

**7. Working – Brief description of procedure performed to carry out the project.**

**8. Observations – readings taken in a tabular form**

**9. Calculations, if any**

**10. Result/ Conclusions**

**11. Applications of the project**

**12. Graphs, if any**

**13. References/bibliography**

**14. Back cover** of **plastic: may be opaque or transparent**

**\* Note: The project should be hand written**
    **Use A-4 size sheets only**

**List of Investigatory Projects**

| S.NO | AIM |
|------|-----|
| 1. | To determine the aspirin content in different medicines. |
| 2. | To Compare the caffeine contents of different samples of tea. |
| 3. | To study the presence of adulterants in chili powder, turmeric powder and pepper. |
| 4. | To observe the crystallization of salts in normal and magnetic conditions |
| 5. | To prepare a perfume sample and analyse its contents |
| 6. | To study the rate of reaction between different alcohols and dilute HCL (Lucas test) |
| 7. | To measure nicotine content in various cancer causing products. |
| 8. | To verify Faraday's law of electrolysis |
| 9. | Preparation of biodiesel and analyzing its components. |
| 10. | To determine the cations and anions present in a powdered sample of Calcium Sandoz. |
| 11. | To estimate the content of vitamin-C in different fruits. |
| 12. | To study the change in pH of various samples like acids due to passage of electricity |
| 13. | To study the quantity of casein present in different samples of milk. |
| 14. | To determine the percentage of acetic acid present in vinegar. |
| 15. | To analyse the components of Hair Gel. |
| 16. | To prepare potash alum from scratch aluminium. |
| 17. | To determine presence and percentage of nickel in chocolate. |
| 18. | To study the efficiency of different antacids in neutralizing stomach acid. |
| 19. | To prepare a sample of soybean milk |
| 20. | To find elevation of boiling point of water on adding different solutes to water |
| 21. | To prepare soap and then determine its foaming capacity |

| | |
|---|---|
| 22. | To analyse the presence of harmful chemicals in Holicolours. |
| 23. | To study the composition of cold drinks for sucrose glucose, $CO_2$ & caffeine content. |
| 24. | To study the presence of adulterants in vegetable oil, ghee, and butter. |
| 25. | To study the effect of metal coupling on rusting of iron. |

# COMPUTER SCIENCE

**PROJECT WORK**

Explore and select an application area or entity for maintaining data using Binary Files in Python program. For Example: School, Hospital, Library, etc. any one of your choice.

Write a **menu-driven program in Python using Binary file to maintain the database** (of the application area or entity chosen by you)with the help user defined functions to complete the following tasks :-

     * Create and add a new record in a binary file
     * Display all records from binary file
     * Search for given record from binary file
     * Delete a given record from the binary file
     * Update the records in the binary file.


**Note:** You can use lists or tuples or dictionaries for storing data in a record in the binary file. Please create the project on the topic approved by your teacher. Donot change the topic without taking approval from teacher in-charge. **This project work will be used for final submission in Board practical exam therefore please refer to curriculum guidelines.**

**THEORY ASSIGNMENT:**

**Topic: Functions**

1. Define the term functions. What is the significance of having functions in a program? Also explain the components of a user defined function.
2. What are the different types of python functions?
3. What are top level statements in python? What is the special name given to them?
4. What are the three types of formal arguments/parameters python supports? Explain with one example.
5. Explain the rules of specifying default arguments.
6. Write the difference between fruitful functions and non-fruitful functions.
7. Write the syntax of returning single value/multiple values from a function.
8. Define the term scope of a variable. Write the difference between global and local scope of a variable with the help of a suitable code.
9. What is lifetime of a variable?
10. What is LEGB rule? Explain in detail with the help of example.

11. What are mutable and immutable arguments of python functions?

**12.** What are nested functions?

**Topic: Using Python Libraries**

13. Define the following terms

   a) Module   b) Library   c) Package   d) docstrings

14. Name some important python libraries.Name the modules that are in Python Standard Library.

15. Write the syntax of

   a. Importing entire module

   b. Importing a single object from module

   c. Importing multiple objects from module

   d. Importing all objects of a module

16. What is the difference between

   a. random() and randint()

   b. **import <module>** and **from <module> import statements**

17. Write the statements to do the following

   a. To generate random numbers between 0 and less than 1

   b. To generate random numbers between 1 to 10

   c. To generate random numbers between 10 to 100

18. Write a short note on urllib module. Also explain the following functions of urllib

   a. Urlopen()      b) open()      c)getcode()      d) headers   e) info()

**Topic: More on SQL**

19. What is order by clause of select statement in MYSQL? Write the syntax and example of select statement with order by clause.

20. How can we order the table on more than one columns? Give example.

21. What is the use of field() in order by clause of select statement?

22. What are aggregate functions? Explain their usage in MYSQL.

23. What is the difference between count(*) and count(MGR) with respect to employee table?

24. What is group by clause? Write the syntax and example of select statement with order by and group by clause.

25. What is having clause? Give example to explain its usage.

26. Differentiate between having clause and where clause of select statement?

# MATHEMATICS

**A) Prepare a mathematical model on any one of the following topics:**

(1) To compute a more realistic picture of the infection rate of novel corona virus that causes COVID-19, enabling better prevention and preparation for future.

(2) Role of math in the cure of cancer

(3) Role of math in setting up a business and maximizing the profit to the company with minimum investment.

(4) Role of mathematics in the automobile industry.

**B) Solve the following questions in a separate register**

Prove each of the following:

Q1. $\cos^{-1}\left(\dfrac{4}{5}\right) + \tan^{-1}\left(\dfrac{3}{5}\right) = \tan^{-1}\left(\dfrac{27}{11}\right)$

Q2. $\tan^{-1}\dfrac{1}{5} + \tan^{-1}\dfrac{1}{7} + \tan^{-1}\dfrac{1}{3} + \tan^{-1}\dfrac{1}{8} = \dfrac{\pi}{4}$

Q3. $\sin^{-1}\left(\dfrac{12}{13}\right) + \cos^{-1}\left(\dfrac{4}{5}\right) + \tan^{-1}\left(\dfrac{63}{16}\right) = \pi$

Q4. $\sin^{-1}\dfrac{8}{17} + \sin^{-1}\dfrac{3}{5} = \tan^{-1}\dfrac{77}{36}$

Q5. $\sin^{-1}\left(\dfrac{5}{13}\right) + \sin^{-1}\left(\dfrac{7}{25}\right) = \cos^{-1}\left(\dfrac{253}{325}\right)$

Q 6. Solve: $\tan^{-1}\dfrac{1-x}{1+x} = \dfrac{1}{2}\tan^{-1}x$ $\qquad\qquad$ ( Ans.x$= \dfrac{1}{\sqrt{3}}$ )

Q7. Simplify the following:

(i) $\tan^{-1}\left(\dfrac{cosx}{1+sinx}\right)$

(ii) $\sin^{-1}(x\surd(1-x)-\surd x\surd(1-x^2))$

Q8. Prove that $\cos^{-1}(3/5) + \cos^{-1}(4/5) = \pi/2$

Q9. Prove that $4(\cot^{-1}3 + \operatorname{cosec}^{-1}\surd5) = \pi$

Q10. Prove that $\sin^{-1}\dfrac{1}{\sqrt{5}} + \cot^{-1}3 = \dfrac{\pi}{4}$

Q11. Find the value of cos ( 2 cos $^{-1}$ x + sin $^{-1}$x) at x = 1/5(-√24/5)

Q12. Simplify the following:

(i) $\cos^{-1}(3/5\cos x+4/5\sin x)$

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(ii) $\tan^{-1}(\frac{a\cos x - b\sin x}{b\cos x + a\sin x})$

Q13. Find the value of $\tan^{-1}(1) + \cos^{-1}(-1/2) + \sin^{-1}(-1/2)$

Q14. Evaluate : $\tan^{-1}\sqrt{3} - \sec^{-1}(-2)$.

Q15. Find the value : $\cos^{-1}(\cos 13\pi/6)$

Q16. Write the function in the simplest form: $\tan^{-1}(\frac{\cos x - \sin x}{\cos x + \sin x})$

Q17. Prove that $\cos^{-1} 12/13 + \sin^{-1} 3/5 = \sin^{-1} 56/65$

Q18. Prove that $\cot^{-1}((\frac{\sqrt{1+\sin x} + \sqrt{(1-\sin x)}}{\sqrt{(1+\sin x)} - \sqrt{(1-\sin x)}}) = x/2$, $x\varepsilon (0,\pi/4)$

Q19. Solve for x : $\sin[\cot^{-1}(x+I)] = \cos(\tan^{-1} x)$

Q20. Evaluate $\sin^{-1}(-1/2) + \cos^{-1}(-1/2)$

Q21. Solve the following for x : $\cos^{-1}(\frac{x^2-1}{x^2+1}) + \tan^{-1}(\frac{2x}{x^2-1}) = 2\pi/3$

Q22. Find the value of $\cot^{-1}\frac{ab+1}{a-b} + \cot^{-1}\frac{bc+1}{b-c} + \cot^{-1}\frac{ac+1}{c-a}$

Q23. If $(\tan^{-1} x)^2 + (\cot^{-1} x)^2 = 5\pi^2/8$, then find x.

Q24. Solve for x: $\sin^{-1} x + \sin^{-1} 2x = \frac{\pi}{3}$.

Q25. Find the greatest and the least values of $((\sin^{-1} x)^2 + (\cos^{-1} x)^2$

Q26. Prove each of the following:

1. $\cos^{-1}\left(\frac{4}{5}\right) + \tan^{-1}\left(\frac{3}{5}\right) = \tan^{-1}\left(\frac{27}{11}\right)$

2. $\tan^{-1}\frac{1}{5} + \tan^{-1}\frac{1}{7} + \tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{8} = \frac{\pi}{4}$

3. $\sin^{-1}\left(\frac{12}{13}\right) + \cos^{-1}\left(\frac{4}{5}\right) + \tan^{-1}\left(\frac{63}{16}\right) = \pi$

## CONTINUITY AND DIFFERENTIABILITY

Q.1

Let f(x) =

| | | |
|---|---|---|
| 3ax+b | if x >1 |
| 11 | if x=1 |
| 5ax-2b | if x<1 |

Find the value of 'a' and 'b' so that f(x) is continuous.

Q2. If the function $f(x) = \underline{x \cos x + \sin x}$ ; $x \neq 0$

$$\frac{\qquad}{x} = k \qquad ; \quad x = 0$$

is continuous at x = 0, find 'k'.

Q3. Find the values of a and b such that the function defined by

$$F(x)=\begin{cases} 5, if x \le 2 \\ ax + b, if\ 2 < x < 10 \\ 21, if x \ge 10 \end{cases}$$

is a continuous function.

Q4.   Show that the function f is continuous at x = 0 for all values of a, where

$$F(x)= \begin{cases} x^2, if x \ge 0 \\ ax, if x < 0 \end{cases}$$

Find the right and left hand derivatives at x = 0. Hence, find the value of a for which f is derivable at x = 0.

Q5. If x=asin2t(1+cos2t) and y=bcos2t(1-cos2t) ,show that $(dy/dx)_{\pi/4}$ =b/a

Q6.   Find the derivative of the following functions w.r.t x :

a. $\left(x^x\right)^x$          b. $\left(x \log x\right)^{\log\log x}$      c $x^{\sin 2x + \cos 2x}$

Q7. If $\cos^{-1}(y/b) = \log(x/n)^n$, prove that $x^2 y_2 + x y_1 + n^2 y = 0$

Q8. Find $\dfrac{dy}{dx}$ If y==(cos x)$^{\log x}$ + (log x)$^x$

Q9.   Differentiate $\tan^{-1}\dfrac{\sqrt{1+x^2} - \sqrt{1-x^2}}{\sqrt{1+x^2} + \sqrt{1-x^2}}$ with respect to $\cos^{-1}x^2$.

Q10. If x = tan( $\dfrac{\log y}{a}$ ), prove that $(1 + x^2)\ y_2 + (2x - a)\ y_1 = 0$

Q11.If x = (cosθ + log tanθ) ; y = Sin θ, find $\dfrac{d^2y}{dx^2}$ at θ = π/4

Q12. If y = (sin$^{-1}$x)$^2$ prove that $(1-x^2)y_2 - xy_1 - 2 = 0$

Q13. Check the applicability of Lagrange's Mean Value theorem for the function f(x)=x$^2$-6x+1 in   (1, 3). Hence find the coordinates of the point at which the tangent is parallel to the chord joining the points (1, -4) and (3, -8).

Q14. Find the point on the graph of y = x$^3$ where the tangent is parallel to the chord joining (1, 1) and (3, 27)

Q15. Verify the applicability of Lagrange's Mean Value theorem for each of the following functions:-

(i) $[x] in [-1,1]$

(ii) x +1/x in $[1,3]$

Q16. It is given that for the function $f(x) = x^3 + bx^2 + ax + 5$ on [1, 3] Rolle's theorem holds with $c = 2 + 1/\sqrt{3}$. Find the values of a and b.

Q17. Discuss the continuity of the function f given by

$$f(x) = \begin{cases} x & \text{if } x \le 0 \\ x^2 & \text{if } x > 0 \end{cases}$$

Q18. For what choice of a and b, is the function

$$F(x) = \begin{cases} x^2, & if x \le c \\ ax + b, & if c < x \end{cases} \text{ differentiable at } x = c.$$

Q19. Show that the function $f(x) = |x| + |x - 1|$, $x \in R$, is continuous at $x = 0$ and $x = 1$.

Q20) Find $\frac{dy}{dx}$ if:-

(i) xsecy+ycosx+3xy=4

(ii) $y = \tan^{-1} \dfrac{3x - x^3}{1 - 3x^2}$

(iii) $y = \dfrac{e^{2x} + e^{-2x}}{e^{2x} - e^{-2x}}$

(iv) $y = \sqrt{\log\{\sin(x^2 - 1)\}}$

(v) $y = \sin^{-1}\left[ \dfrac{\sqrt{1+x} - \sqrt{1-x}}{2} \right]^3$

(vi) $x\sqrt{1+y} + y\sqrt{1+x} = 0$

(vii) $y = (\cos x)^{\log x} + (\log x)^x$

Q21)Verify Rolle's theorem for the following functions:-

Q1) $f(x) = \dfrac{1}{4x-1}$ , [1, 4]

Q2) $f(x) = \sin^4 x + \cos^4 x$, [0, π/2]

Q3) $f(x) = [x]$ ; [0, 1]

Q22) Verify the applicability of Lagrange's Mean Value theorem for each of the functions:-

Q4) $f(x) = \sin x - \cos x$ in interval $[\pi/4, 5\pi/4]$

Q5) $f(x) = (x-a)^3 (x-b)^4$        [a, b]

Q6) $f(x) = x(x+3)e^{-x/2}$        [-3, 0]

Q23) Let $f(x) = \frac{\sqrt{4+x}-2}{x}, x \neq 0$. For $f(x)$ to be continuous at x = 0, find f(0).

Q24) Find dy/dx: $\sin^2 y + \cos xy = \pi$.

Q25) Differentiate $\tan^{-1}\left(\left(\frac{3x-x^3}{1-3x^2}\right)\right.$ w.r.t. $\tan^{-1}\left(\frac{x}{\sqrt{1-x^2}}\right)$.

Q26) Determine f(0), so that the function f(x) defined by
$$f(x) = \frac{(4^x-1)^3}{\sin\frac{x}{4}\log\left(1+\frac{x^2}{3}\right)}$$ becomes continuous at x=0.

Q27) Discuss the continuity of function at $x = \frac{\pi}{2}$.

$$f(x) = \begin{cases} \frac{Kcosx}{\pi-2x} \, atx \neq \frac{\pi}{2} \\ \\ 4 \quad\quad atx = \quad \pi/2 \end{cases}$$

Q28) If $x = 3cos\theta - 2cos^3\theta$ and $y = 3sin\theta - 2sin^3\theta$; find $\frac{d^2y}{dx^2}$.

Q29) Verify Lagrange's Theorem for the function $f(x) = x^3 + 2x + 3$, on [4, 6].

Q30)If $y = (\log x)^x + x^{\log x}$, find dy/dx.

Q31)If $x = a(\theta + sin\theta)$, and $y = a(1 - cos\theta)$, find $\frac{d^2y}{dx^2}$ at $\theta = \frac{\pi}{2}$.

Q32)If $y = \log [x + \sqrt{x^2 + a^2}]$, prove that $(x^2 + a^2) \frac{d^2y}{dx^2} + x\frac{dy}{dx} = 0$

Q33). For what value of $\alpha$, is the function defined by
$$f(x) = \begin{cases} \alpha(x^2 - 2x) \text{, if } x \leq 0 \\ 4x + 1 \text{, if } x > 0 \end{cases}$$
is continuous at x = 0 ? What about continuity at x =1?

Q34) Find $\frac{dy}{dx}$ if $x^y + y^x = 1$

Q35) If $x = \sqrt{a^{\sin^{-1}t}}$, and $y = \sqrt{a^{\cos^{-1}t}}$, show that $\frac{dy}{dx} = \frac{-y}{x}$