1. Find the equation of the tangent line to \( f(x) = \frac{1}{x} \) at \( x = 2 \).

2. Find a value of \( c \) for which the conclusion of the Mean Value Theorem is true. \( f(x) = x^3 - 2x \) on the interval \([0, 1]\).

3. Find the limit. \( \lim_{x \to 0} x^{3/\sqrt{3}} \)

4. Find the speed of the particle when it crosses the \( x \)-axis the first time. The particle's position is given by the parametric equations:
\[
\begin{align*}
    x(t) &= \sin(t(2 - \cos t)) \\
    y(t) &= 2 \sin t - 1
\end{align*}
\]

5. Use the Fundamental Theorem to compute the integral exactly. \( \int_0^{\sqrt{2}} 4 \sqrt{1 - x^2} \, dx \)

6. Evaluate the integral. \( \int e^{-x} \sin(x) \, dx \)

7. Evaluate the integral. \( \int_{-1}^{1} \frac{x-1}{x^2 - 7x + 10} \, dx \)

8. Find the area of the region bounded by the curves. \( x = 4 - y^2, \ x = -2 \)

9. Find the volume of the solid with cross-sectional area \( A(x) = \pi(8 - x)^3, \ 0 \leq x \leq 8 \).

10. Solve the initial value problem. \( y' = \frac{x}{\cos y}, \ y(0) = 0 \)

11. Find \( \frac{\partial^2 f}{\partial x \partial y} \) if \( f(x, y) = 3x^3 - xy^2 + x^2 y + 5y^3. \)

12. Compute the directional derivative of \( f(x, y) = x^2 + y^2 - xy + 6 \) at the point \((2, 1)\) in the direction of the unit vector \( \mathbf{u} = \left(\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}\right) \).

13. Find the volume of the solid formed by revolving the region bounded above by the parabola \( y = 1 - x^2 \) and below by the \( x \)-axis, about the \( x \)-axis.
二、計算題：
1. (10%) Find a power series representation of \( f(x) \) about \( c = 0 \) and give the interval of convergence. \( f(x) = \frac{7}{1+x} \).
2. (12%) Find the Fourier series of the function on the given interval.
   \[
f(x) = \begin{cases} 
-\frac{1}{2}, & -1 < x < 0 \\
\frac{1}{2}, & 0 < x < 1 
\end{cases}
\]

※〈選擇題答案欄〉

<table>
<thead>
<tr>
<th>答案編號</th>
<th>答案欄</th>
<th>答案編號</th>
<th>答案欄</th>
<th>答案編號</th>
<th>答案欄</th>
<th>答案編號</th>
<th>答案欄</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>( \frac{1}{3} \ln</td>
<td>x-5</td>
<td>- \frac{4}{3} \ln</td>
<td>x-1</td>
<td>+ C )</td>
<td>2.</td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>( \frac{3}{\sqrt{2}} )</td>
<td>6.</td>
<td>2</td>
<td>7.</td>
<td>( \frac{1}{\sqrt{3}} )</td>
<td>8.</td>
<td>( \frac{125}{6} )</td>
</tr>
<tr>
<td>9.</td>
<td>( \frac{2\sqrt{3}}{2\sqrt{3}-1} )</td>
<td>10.</td>
<td>does not exist</td>
<td>11.</td>
<td>( y = \tan^{-1} \left( \frac{x^2}{2} \right) )</td>
<td>12.</td>
<td>( \frac{2}{\sqrt{3}} )</td>
</tr>
<tr>
<td>13.</td>
<td>( \frac{4}{3} \ln</td>
<td>x-5</td>
<td>- \frac{1}{3} \ln</td>
<td>x-2</td>
<td>+ C )</td>
<td>14.</td>
<td>2x - 2y</td>
</tr>
<tr>
<td>17.</td>
<td>( \frac{1}{4} \ln</td>
<td>x-5</td>
<td>- \frac{4}{3} \ln</td>
<td>x-1</td>
<td>+ C )</td>
<td>18.</td>
<td>( \frac{16\pi}{15} )</td>
</tr>
<tr>
<td>19.</td>
<td>( y = \tan^{-1} \left( \frac{\pi x^2}{2} \right) )</td>
<td>20.</td>
<td>( \frac{512\pi}{3} )</td>
<td>21.</td>
<td>( \frac{\sqrt{6} - \sqrt{2}}{2} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>( \frac{\pi}{2} )</td>
<td>23.</td>
<td>( \frac{10\pi}{3} )</td>
<td>24.</td>
<td>( y = 4\sin^{-1} \left( \frac{x}{2} \right) )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>( -\frac{e^{-x}}{2} (\sin x + \cos x) + C )</td>
<td>26.</td>
<td>2e^{-x} (\sin x - 2 \cos x) + C</td>
<td>27.</td>
<td>( \frac{3\pi}{2} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>( \pi )</td>
<td>29.</td>
<td>( x^2 + 2x - 2y^2 )</td>
<td>30.</td>
<td>None of the above</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Describe the subsystems of the von Neumann computer model.
2. What is the smallest unit of data that can be stored in a computer?
3. How many bits do you require to represent 36 different symbols?
4. Why does the computer use the binary system for storage and processing?
5. A computer has 32MB of memory. Each word in this computer is 4 bytes. How many bits are needed to address any single word in memory?
6. Show the result of x0F OR (x99 AND xF0) in hexadecimal notation.
7. Represent -60 using two's complement with 8 bits.
8. Convert 8.75 from decimal to binary representation.
10. Discuss the difference between a queue and a stack. Give one example of the applications of a queue and a stack.
11. Given a binary tree with a height of 5, what are the maximum and the minimum numbers of nodes?
12. Draw a graph for the adjacency matrix representation given below.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>C</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

13. The factorial function is defined as
   \[ A(n) = \begin{cases} 1 & \text{if } n = 0 \\ n \times A(n-1) & \text{if } n > 0 \end{cases} \]

   Complete the following two C functions that implement the factorial function. The first function implements the factorial function recursively; the second function implements the function iteratively.

   ```c
   int factorial_r(int n) {
     // recursive factorial function
   }

   int factorial_i(int n) {
     // iterative factorial function
   }
   ```