1. Let \( f(x) = x^3 - 12x + 4 \). Find:
   a) The critical values.
   b) The local extrema.

\[ \text{Ans: } \]
\[ \text{Ans: } \]

2. Sketch the graph of \( y = \frac{x}{x^2 + 4} \). Show everything (ie: Max, min, IP’s, asymptotes)

\[ \text{Max: } \]
\[ \text{Min: } \]
\[ \text{IP’s: } \]
\[ \text{Asymp: } \]

3. a) Use l’Hôpital’s rule to find: \( \lim_{x \to 1} \frac{x^3 - 1}{x - 1} \)
   b) Use l’Hôpital’s rule to find: \( \lim_{x \to \infty} x^{1/x} \)

\[ \text{Ans: } \]
\[ \text{Ans: } \]

4. Sketch a graph of a function satisfying the given conditions:
   a) \( f(2) = 3, \ f'(2) = 1, \ f''(2) = -2 \)
   b) \( f(3) = 2, \ f''(x) < 0 \text{ for } x < 3; \ f''(x) > 0 \text{ for } x > 3. \)

5. Find the absolute maximum of \( f(x) = x^{2/3}(8 - x) \) in the interval \([0, 8]\).

\[ \text{Ans: } \]
<p>| | |</p>
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<tr>
<td><strong>6.</strong></td>
<td>A box with a square base and no lid must have a volume of 32 m$^3$. Find the dimensions that will require the minimum amount of material.</td>
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<td>Ans:</td>
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<td><strong>7.</strong></td>
<td>Air is pumped into a spherical balloon at the rate of 12 m$^3$/s. How fast is the radius $r$ increasing when $r = 3$ m?</td>
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<td>Ans:</td>
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| **8.** | The position of a particle in the interval $[1, 4]$ is given by $s(t) = 2t^2 - 4t + 1$.  
\[ a) \text{ Find the average velocity in this interval.} \]  
\[ b) \text{ Find a "c" satisfying the MVT on } I = [1, 4]. \] |
| Ans: |   |
| **9.** | Find the antiderivative $f$.  
\[ a) f'(x) = \frac{3x^2 - x + 2}{4x} \]  
\[ b) f'(x) = 3 \sin x + 5 \sec x \tan x. \] |
| Ans: |   |
| **10.** | The acceleration of a particle is given by $a(t) = -32$, with $v(0) = 8$ and $s(0) = 24$.  
\[ a) \text{ Find the velocity of the particle.} \]  
\[ b) \text{ Find the position of the particle.} \] |
| Ans: |   |

Extra space