(1) Evaluate each of the following integrals. (45pts)

(i) \[ \int \frac{dx}{4x(\sqrt{x} - \sqrt[4]{x})}. \]

(ii) \[ \int \frac{dx}{3 - 5\sin x}. \]
(iii) \int \cosh^3 x \,dx

(iv) \int \frac{dx}{(x^2+2x+2)^2}
(iv) \( \int (\sin^{-1}x)^2 \, dx \)
(2) The region bounded by the graph of $y = x^2$ and $x = y^3$ is revolved about the line $x = 1$.

Find the volume of the resulting solid.  

(15pts)
(3) Find the exact arc length of the parametric curve 

\[ x = 2e^t, \quad y = \frac{1}{2}e^{2t} - t \quad (0 \leq t \leq 1). \]
(4) Find the area of the surface formed by revolving about the x-axis the curve

\[ y = \sqrt{4 - x^2}, \quad -1 \leq x \leq 1. \]
(5) Set up the partial fraction decomposition of \( \frac{1}{(x^4 - 1)(x^3 + 1)^3} \).

(DO NOT CALCULATE THE CONSTANTS) (10pts)
(6) Complete the blanks. (Show your work) (10pts)

(i) \( \tanh(\ln x) \) is equal to ............

(ii) For all real \( x \), \( \frac{\sech^2 x}{1 + \tanh^2 x} \) is equal to ............

(iii) If \( y = (\sech x)(\csch x) \) then \( y' \) is equal to ............
(1) Evaluate each of the following integrals. (45pts)

(i) \[ \int \frac{dx}{2e^x + 1}. \]

(ii) \[ \int \cos^2 \frac{x}{2} \sin^4 \frac{x}{2} dx \]
(iii) \( \int (\cosh x - \sinh x)^{10} \, dx \)

(iv) \( \int \frac{dx}{\sqrt{x^2 - 6x + 13}} \)
(iv) $\int (\sin^{-1} x)^2 \, dx$
(2) The region bounded by the graph of $y = x^2$ and $x = y^3$ is revolved about the line $x = 1$.

Find the volume of the resulting solid.  

(15pts)
(3) Find the exact arc length of the curve

\[ y = \left( \frac{x}{2} \right)^{2/3} \] from \( x = 0 \) to \( x = 2 \).
(4) Find the area of the surface formed by revolving about the x-axis the parametric curve
\[ x = \sin^2 t, \ y = \sin t \cos t, \ 0 \leq t \leq \frac{\pi}{2}. \] (10pts)
(5) Set up the partial fraction decomposition of \( \frac{1}{(x^3+1)(x^3-1)^2} \).

(DO NOT CALCULATE THE CONSTANTS) (10pts)
6. Complete the blanks. (Show your work) (10pts)

(i) \( \coth(\ln x) \) is equal to ............

(ii) For all real \( x \), \( \frac{\csc h^2 x}{1+\coth^2 x} \) is equal to ............

(iii) If \( y = (\text{sech} x)(\text{csch} x) \) then \( y' \) is equal to ............

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