733002B

(10%) 1. Solve $\dfrac{e^x + e^{-x}}{2} = 3$

(10%) 2. Given $y' = \dfrac{x}{2x^2 + 1}$, $y(0) = 1$, find y.

(10%) 3. Determine those points on the graph of $f(x) = \dfrac{x^3}{3} + \dfrac{x^2}{2} - 2x$ where the slope is zero.

(10%) 4. Compute $D_h \displaystyle\int_{h^2}^{h^3} \left(\dfrac{\sin t}{t}\right) dt$

(10%) 5. A real function f is said to be *increasing* on an interval $<a, b>$ if $x_1 < x_2$ imply that $f(x_1) < f(x_2)$, where x_1, x_2 belong to $<a, b>$. Show that if the derivatives of f are greater than zero on $<a, b>$, then f is increasing on $<a, b>$.

6. (10%) Find the Maclaurin series for $f(x) = (1 + x)^{1/3}$ and use it to compute $(30)^{1/3}$, correct to three places.

7. (10%) Find all values of x for which the series $\sum \dfrac{(x-1)^n}{n^2 3^n}$ converges. Distinguish between absolute and conditional convergence.

8. (10%) Find the area of the region inside the four-leaf rose $r = \sin 2\theta$.

9. (10%) Find the tangent plane to the sphere $x^2 + y^2 + z^2 = 9$ at point $(1, 2, 2)$.

10. (10%) Find and interpret the directional derivative of $f(x, y) = 4 - x^2 - y^2$ at $(1, 1)$ in the direction "Northeast"