

Problem 1. (a) Let $f(x) = \sqrt[3]{x^5 + x^4 + x^3 + x^2 + 2x}$. Find $(f^{-1})'(4)$.

(b) Find $\lim_{x \rightarrow 0} \frac{2 \sin(x) - \sin(2x)}{x - \sin(x)}$.

(c) Compute the following. In all cases your answers should be exact, with no decimals, and no logs or exponentials or trig functions..

$$\ln(e^3) + \ln(3) + \ln(e/3) =$$

$$\arcsin(-\sqrt{2}/2) =$$

$$\cos(\arcsin(3/7)) =$$

Problem 2. (a) Compute $g'(4)$ where $g(x) = \ln(x^3 + 3x + \sqrt{x})$.

(b) Find the tangent line to $h(x) = \arcsin(e^x)$ at $\ln(1/2)$.

(c) Use Simpson's rule and six intervals to estimate $\int_0^6 x^4 dx$.

Problem 3. Compute the following integrals:

(a) $\int \frac{2x+1}{\sqrt{x^2-1}} dx$

(b) $\int x \sec^2 x dx$

(c) $\int_0^1 \frac{3x^2 - 6x + 1}{(x^2 - x - 1)(x - 2)} dx$

Problem 4. (a) Does $\int_0^{\infty} \frac{x}{x^3 + 1} dx$ converge or diverge? Why?

(b) Find the arc length of the curve $y = \frac{1}{3}(2 + x^2)^{3/2}$ from between $x = 0$ and $x = 2$.

(c) Find the surface area of the surface obtained by rotating $y = \sqrt{5 + 4x}$ for $-1 \leq x \leq 1$ about the x -axis.