

3. (10 pts.) Find the derivative of $x^{-3}(\sqrt{x} - 1)$.

4. (10 pts.) Let $f(x) = \frac{x^3+3x^2+5x-1}{x+1}$. Find the average rate of change of y with respect to x as x moves from $x = 1$ to $x = 3$.

5. (10 pts.) Find the derivative of $\frac{3x-1}{2-x} + \frac{4}{x}$.

6. (15 pts.) Sam and Helga both put \$75 into their bank accounts at the same time. Three years later they have the same amount of money and neither has made any deposits or withdrawals. If Sam's account bore interest at a rate of 15% annually, and Helga's account accrued interest quarterly, then what was the rate on Helga's account?

7. (15 pts.)

- (a) Apple believes there's a linear relationship between the price p (in dollars) they can charge per iPod and the number of units x they can sell at that price. Market research shows the relationship is $p = p(x) = -0.0005x + 400$. Given this, if they set the price at \$200, how many iPods can they expect to sell?
- (b) It costs \$16,500,000 to make 100,000 iPods and \$21,500,000 to make 150,000 iPods. Find the straight-line relationship between the number of units produced x and the total cost $C = C(x)$ of producing those x units.
- (c) Find the revenue and profit functions for the iPods. What number of iPods should be produced to maximize the profit? (*Hint:* The profit function is an upside-down parabola, so the maximum profit occurs at the vertex. The vertex of a parabola can be found by taking the average of the two roots of the equation describing the parabola.)