

1. (40 points) Compute the following derivatives. Simplify your answers.

(a) $y = \frac{5}{11(x^4 - 3x + 1)^{1/5}}$

(b) $y = \sec^3\left(\frac{1}{x^2}\right)$

(c) $y = (3x^4 - 7x + 1) \cot(5 - 4x)$

(d) $y = \sin(5x) \cos(3x)$

(e) $y = \frac{\frac{3}{x^2} + 4}{\frac{9}{x^2} - 7}$

2. (30 points) Find all x -coordinates of points at which the given function has a horizontal tangent.

(a) $y = \frac{10}{\sqrt{x}} - \frac{2}{x^3} + 6$

(b) $y = (3x - 8)^{10}\sqrt{2x + 5}$

(c) $y = \frac{x^5}{(2x + 3)^4}$

3. (10 points) Given the curve $x \sin(y) + x^2 y^5 + y^2 = \frac{\pi^2}{4}$, find the following:

(a) the formula for $\frac{dy}{dx}$

(b) the equation of the line tangent to the curve at the point $(0, \frac{\pi}{4})$.

4. (10 points) Let $f(x) = \frac{1}{x^3}$.

(a) Find the formula for $L(x)$, the linearization of $f(x)$ at $a = 10$.

(b) Use $L(x)$ to approximate $\frac{1}{(10.03)^3}$.

5. (15 points) A 12 foot ladder is sliding down a wall. At the time when the foot of the ladder is 3 feet from the wall, the top of the ladder is sliding down the wall at a rate of 2 f/s. How fast is the foot of the ladder sliding across the floor at this time?