

1. 10 pts. each Use differentiation rules to find the derivative of each function.

(a)  $s(t) = 4\sqrt{t} - \frac{1}{4}t^4 + t + 1$

(b)  $f(x) = \frac{x^4 + 1}{x^2 - 1}$

(c)  $y = \sin x \tan x$

(d)  $y = \frac{2 \cos x}{1 + \sin x}$

2. 10 pts. Let  $f(x) = 2x^3 - 3x^2 - 12x + 4$ . Find all points on the graph of  $f$  at which the tangent line has slope 60.

3. 10 pts. each Find the derivative of the function using the Chain Rule.

(a)  $y = (4x - 3x^5)^{16}$

(b)  $y = \tan \sqrt{x}$

(c)  $h(x) = \sin^4(\cos 7x)$

4. 10 pts. Use implicit differentiation to find  $dy/dx$ , given that

$$x^3 = \frac{x + y}{x - y}.$$

5. 10 pts. Find an equation of the tangent line to the curve given by

$$xy^{5/2} + x^{3/2}y = 12$$

at the point  $(4, 1)$ .

6. 10 pts. The height of a triangle is decreasing at a rate of 1 cm/min while the area is increasing at a rate of 2 cm<sup>2</sup>/min. At what rate is the base of the triangle changing when the height is 12 cm and the area is 150 cm<sup>2</sup>?

7. 10 pts. A 13-ft ladder is leaning against a vertical wall when Vladimir begins pulling the foot of the ladder away from the wall at a rate of 0.5 ft/s. How fast is the top of the ladder sliding down the wall when the foot of the ladder is 5 ft from the wall?