

1. **(8 points)** Calculate the derivatives of the following functions:

(a) **(2 points)**  $f(x) = \pi^5$ .

(b) **(3 points)**  $g(t) = 4t + \frac{2}{3t^2}$ .

(c) **(3 points)**  $h(u) = 7\sqrt[4]{u} + \frac{\sqrt{u}}{u}$ .

2. **(8 points)** Let  $f(x) = 6x^2 - 3$ .

(a) **(4 points)** Find  $f'(x)$  using the difference quotient.

(b) **(4 points)** Find the equation of a line tangent to the curve  $y = 6x^2 - 3$  at the point  $(-2, 21)$ .

3. **(8 points)** Solve the problems given below.

(a) **(4 points)** Find  $\frac{d}{dx} \frac{x^2-3}{4x+5}$ .

(b) **(4 points)** Given  $f(t) = \sqrt{x} \left( e^x + \frac{1}{x} \right)$ , find  $f'(t)$ .

4. **(2 point bonus)** Using rules learned in the class so far, demonstrate that the derivative with respect to  $x$  of  $e^{3x}$  is  $3e^{3x}$ .