

3. (5 pts) Use the Fundamental Theorem of Calculus to calculate the exact value of the integral  $\int_3^4 (\frac{1}{x} - 4x) dx$ . Show your work.

$$\text{If } f'(x) = \frac{1}{x} - 4x, \text{ then}$$

$$f(x) = \ln x - 4 \frac{x^2}{2} + C$$

$$= \ln x - 2x^2 + C$$

(we won't need  $C$   
to evaluate a  
definite integral)

$$\text{So, } \int_3^4 (\frac{1}{x} - 4x) dx = \ln x - 2x^2 \Big|_3^4 = \ln 4 - 32 - \ln 3 + 18 = \ln \frac{4}{3} - 14$$

4. (5 pts) Given that  $g'(3) = 8$ , and that when  $x = 3$ ,  $\frac{d}{dx} f(g(x)) = 20$ , find  $f'(g(3))$ .

$$\frac{d}{dx} f(g(x)) = f'(g(3)) g'(3) \quad (\text{chain rule})$$

Substituting the given values:

$$20 = f'(g(3)) \cdot 8$$

$$f'(g(3)) = \frac{20}{8} = 2.5$$