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.**

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

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:

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

$$f'(g(3)) = \frac{5}{2} = 2.5$$