

MATH 112 SOLUTIONS FOR 2.9, P. 195

2. $\frac{dG}{dW}$ is the rate of change of population growth rate as a function of average per capita wage, in people per thousand per dollars per year. $\frac{dQ}{dP}$ is the rate of change of average per capita wage as a function of mine production rate, measured in dollars per year per tons per year. $\frac{dG}{dP}$ is the rate of change of population growth rate as a function of mine production rate, measured in people per thousand per tons per year.
3. (b) $5(2x - x^2)^4(2 - 2x)$. (c) $-\frac{8}{x^2}(\frac{2}{x})^3$. (d) $3(x - \frac{1}{x})^2(1 + \frac{1}{x^2})$. (f) $3(1 - \cos x)^2 \sin x$. (g) $-2x \sin(x^2)$. (h) $5 \sec^2 5x$. (j) $2xe^{x^{\frac{5}{2}}}$. (k) $3 \cdot 10^{3x} \ln 10$. (l) $2^{\sin x} \ln 2 \cos x$.
4. (b) $3 \sec 3x \tan 3x \tan 4x + 4 \sec 3x \sec^2 4x$. (d) $-5\pi \cos^4 \pi x \sin \pi x$. (f) $e^{-x}(-\cos 3x - 3 \sin 3x)$. (l) $\frac{7e^{-.02x}}{(1 + 7e^{-.02x})^2}$.
5. (c) $-2x \sin(x^2 + 4)$. (f) $9(x^3 - 1)^2 x^2$.
6. (a) (iv)
7. If $y = [f(x)]^n$, let $y = u^n$, $u = f(x)$. Then $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx} = nu^{n-1} f'(x) = n[f(x)]^{n-1} f'(x)$.
8. $\frac{d}{dx}(a^x) = \frac{d}{dx}(e^{x \ln a}) = (\ln a)e^{x \ln a} = (\ln a)a^x$.
9. -42
11. 0
15. $a = \frac{dv}{dt} = \frac{dv}{ds} \cdot \frac{ds}{dt} = v \frac{dv}{ds}$.
18. If f is an even function, then $f(-x) = f(x)$. Differentiating, we get $f'(-x)(-1) = f'(x) \Rightarrow f'(-x) = -f'(x)$, and f' is an odd function.