

Worksheet 10: Monday 10/2

Acknowledgment: This worksheet has been adapted from that of Gabriel Beiner, a current GSI.

Key Points:

After 10/2 Monday's lecture, you should be able to:

- Apply derivative rules for computing derivatives

Exercises:

1. Compute the derivative of the following functions:

(a) $f(t) = 2t^{-3/4}$

(b) $y(x) = \sqrt[3]{x}(2+x)$

(c) $g(x) = 3e^x + 4x^{-1/3}$

(d) $h(t) = \sqrt{5t} + \frac{1}{t}\sqrt{7}$

(e) $q(v) = \frac{1}{v}(\sqrt[3]{v} - 2\sqrt[5]{v}e^v)$

(f) $k(r) = e^r + r^e$

(g) $f(y) = A/y^{10} + Be^y$

(h) $\ell(p) = e^p(p + p\sqrt{p})$

(i) $m(z) = (z^2 + e^z)(\sqrt{z} + 2)$

(j) $J(v) = (v^3 - 2v)(v^{-4} + v^{-2})$

(k) $k(r) = ae^r/(b + e^r)$

(l) $w(x) = x/e^x$

2. Find the first and second derivatives of:

(a) $f(x) = x^4 - 3x^3 + 16x$

(b) $f(r) = \sqrt{r} + \sqrt[3]{r}$

(c) $g(y) = 3e^y - 5y$

3. Find the points on the curve $y(x) = 2x^3 + 3x^2 - 12x + 1$ where the tangent line is horizontal.

4. Find a quadratic polynomial $p(x)$ so that $p(2) = 5$, $p'(2) = 3$ and $p''(2) = 2$.

5. Find the derivative of $e^{(ax+b)}$. (No chain rule!)

6. Bonus problems:

(a) Find the n -th derivatives of x^n and $1/x$.

(b) Find the 100th derivative of xe^x .

(c) Find the 123,456,789th derivative of $5e^{x+1} + 3e^{-x-1}$.