Math 141A Fall 2014

Differentiation Facts

1. **Differentiation Rules**

| constant multiple rule | sum rule | difference rule |
|---|---|---|
| $(cf)' = cf'$ | $(f+g)' = f' + g'$ | $(f-g)' = f' - g'$ |
| **product rule** | **quotient rule** | **chain rule** |
| $(fg)' = f'g + fg'$ | $\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$ | $[f(g(x))]' = f'(g(x))g'(x)$ |

2. **Basic Function Derivatives**

| power | natural exponential | natural logarithm |
|---|---|---|
| $(x^n)' = nx^{n-1}$ | $(e^x)' = e^x$ | $(\ln x)' = \frac{1}{x}$ |
| | general exponential | general logarithm |
| | $(a^x)' = a^x \ln a$ | $(\log_b x)' = \frac{1}{x \ln b}$ |
| sine | cosine | tangent |
| $(\sin x)' = \cos x$ | $(\cos x)' = -\sin x$ | $(\tan x)' = \sec^2 x$ |
| inverse sine | inverse cosine | inverse tangent |
| $(\arcsin x)' = \frac{1}{\sqrt{1-x^2}}$ | $(\arccos x)' = \frac{1}{-\sqrt{1-x^2}}$ | $(\arctan x)' = \frac{1}{1+x^2}$ |