

## Derivatives and Antiderivatives (Summary of 4.9)

| Differentiation |                                      | Antiderivatives/Integrals |                                   |
|-----------------|--------------------------------------|---------------------------|-----------------------------------|
| $f$             | $f'$                                 | $f$                       | $F$                               |
| $cf$            | $cf'$                                | $cf$                      | $cF$                              |
| $f \pm g$       | $f' \pm g'$                          | $f \pm g$                 | $F \pm G$                         |
| $fg$            | $f'g + fg'$                          | $1$                       | $x$                               |
| $f(g(x))$       | $f'(g(x))g'(x)$                      | $x^n$                     | $\frac{1}{n+1}x^{n+1}, n \neq -1$ |
| $\frac{f}{g}$   | $\frac{f'g - fg'}{g^2}$              | $1/x$                     | $\ln x $                          |
| $f(x)^{g(x)}$   | Use log diff.                        | $e^x$                     | $e^x$                             |
| $c$             | $0$                                  | $a^x$                     | $\frac{1}{\ln(a)}a^x$             |
| $x^n$           | $nx^{n-1}$                           | $\cos(x)$                 | $\sin(x)$                         |
| $e^x$           | $e^x$                                | $\sin(x)$                 | $-\cos(x)$                        |
| $a^x$           | $a^x \ln(a)$                         | $\sec^2(x)$               | $\tan(x)$                         |
| $\ln x $        | $\frac{1}{x}$                        | $\sec(x)\tan(x)$          | $\sec(x)$                         |
| $\log_a(x)$     | $\frac{1}{x} \cdot \frac{1}{\ln(a)}$ | $\csc(x)\cot(x)$          | $-\csc(x)$                        |
| $\sin(x)$       | $\cos(x)$                            | $\csc^2(x)$               | $-\cot(x)$                        |
| $\cos(x)$       | $-\sin(x)$                           | $\frac{1}{\sqrt{1-x^2}}$  | $\sin^{-1}(x)$                    |
| $\tan(x)$       | $\sec^2(x)$                          | $\frac{1}{1+x^2}$         | $\tan^{-1}(x)$                    |
| $\sec(x)$       | $\sec(x)\tan(x)$                     |                           |                                   |
| $\csc(x)$       | $-\csc(x)\cot(x)$                    |                           |                                   |
| $\cot(x)$       | $-\csc^2(x)$                         |                           |                                   |
| $\sin^{-1}(x)$  | $\frac{1}{\sqrt{1-x^2}}$             |                           |                                   |
| $\tan^{-1}(x)$  | $\frac{1}{1+x^2}$                    |                           |                                   |