

## Formulas for Exam 3

### 1. Derivatives.

$y$	$x^n$	$e^x$	$b^x$	$\ln x$	$\log_b x$	$\sin x$	$\cos x$
$y'$	$nx^{n-1}$	$e^x$	$b^x \ln b$	$\frac{1}{x}$	$\frac{1}{x} \cdot \frac{1}{\ln b}$	$\cos x$	$-\sin x$

### 2. Rules of Differentiation.

(a) Product rule.

$$\text{If } y = f \cdot g, \text{ then } y' = f' \cdot g + g' \cdot f$$

(b) Quotient rule.

$$\text{If } y = \frac{f}{g}, \text{ then } y' = \frac{f' \cdot g - g' \cdot f}{g^2}$$

(c) Chain rule.

$$\text{If } y = f(g(x)), \text{ then } y' = f'(g(x)) \cdot g'(x)$$

### 3. Tangent Line. $y_0 = f(x_0), m = f'(x_0)$

$$y - y_0 = m(x - x_0)$$

### 4. Average and instantaneous rate of change.

(a) The average rate of change of  $f(x)$  over  $[a, b]$ :

$$\frac{f(b) - f(a)}{b - a}$$

(b) The instantaneous rate of change of  $f(x)$  at  $x = a$ :  $f'(a)$ .

5. **Applications.** The velocity  $v(t) = s'(t) = \frac{ds}{dt}$  and the acceleration  $a(t) = v'(t) = \frac{dv}{dt} = s''(t) = \frac{d^2s}{dt^2}$ .

6. **Quadratic equation formula.**  $ax^2 + bx + c = 0$  for

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$