Notes

- *Quadratic formula*

  $ax^2 + bx + c = 0$ gives $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

- *Derivatives*

$\dfrac{d}{dx}(\text{constant})$	0
$\dfrac{d}{dx}(x^n)$	nx^{n-1}
$\dfrac{d}{dx}(e^x)$	e^x
$\dfrac{d}{dx}(\ln x)$	$\dfrac{1}{x} \qquad (x > 0)$
$\dfrac{d}{dx}(\sin x)$	$\cos x$
$\dfrac{d}{dx}(\cos x)$	$-\sin x$

$\dfrac{d}{dx}(cy)$	$c\dfrac{dy}{dx}$
$\dfrac{d}{dx}(y+z)$	$\dfrac{dy}{dx} + \dfrac{dz}{dx}$
$\dfrac{d}{dx}(y \cdot z)$	$y\dfrac{dz}{dx} + z\dfrac{dy}{dx}$
$\dfrac{d}{dx}\left(\dfrac{y}{z}\right)$	$\left(z\dfrac{dy}{dx} - y\dfrac{dz}{dx}\right) \Big/ z^2$

- *Standard integrals*

$$\int x^n\,dx = \begin{cases} \dfrac{x^{n+1}}{n+1} + C & n \neq -1 \\ \ln|x| + C & x \neq 0, n = -1 \end{cases}$$

$$\int \sin x\,dx = -\cos x + C$$

$$\int \cos x\,dx = \sin x + C$$

$$\int e^x\,dx = e^x + C$$

- *Integration Techniques*

$$\int kf(x)\,dx = k\int f(x)\,dx$$

$$\int [f(x) + g(x)]\,dx = \int f(x)\,dx + \int g(x)\,dx$$

Integration by recognition

If F is an indefinite integral for f

$$\int f(g(x))\,g'(x)\,dx = F(g(x)) + C$$

Integration by substitution

Let $u = g(x)$. Then

$$\int f(g(x))\,g'(x)\,dx = \int f(u)\,du$$

- *Functions of Two Variables*

  Tangent plane to the surface $z = f(x, y)$ at the point (a, b):

  $$z = f(a, b) + f_x(a, b)(x - a) + f_y(a, b)(y - b).$$

  The differential of a function $z = f(x, y)$ at the point (a, b):

  $$df = f_x(a, b)dx + f_y(a, b)dy.$$