

## Non-AP Calculus Spring Semester Formula and Summary Sheet

Rectangle Area = width  $\times$  height

Trapezoid Area =  $\frac{w}{2}(h_1 + h_2)$

---

### Derivative Rules:

**Product Rule:**  $\frac{d}{dx}[f(x)g(x)] = f'g + fg'$

**Quotient Rule:**  $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{f'g - fg'}{g^2}$

$$\frac{d}{dx}[uv] = uv' + vu'$$

$$\frac{d}{dx}\left[\frac{u}{v}\right] = \frac{vu' - uv'}{v^2}$$

**Power Rule:**  $\frac{d}{dx}[u^n] = nu^{n-1}u'$

**Natural Log Rule:**  $\frac{d}{dx}[\ln u] = \frac{u'}{u}$

**Chain Rule:**  $\frac{d}{dx}f[g(x)] = f'[g(x)] \times g'(x)$

$$10. \frac{d}{dx}[e^u] = e^u u'$$

$$11. \frac{d}{dx}[\log_a u] = \frac{u'}{(\ln a)u}$$

$$12. \frac{d}{dx}[a^u] = (\ln a)a^u u'$$

$$13. \frac{d}{dx}[\sin u] = (\cos u)u'$$

$$14. \frac{d}{dx}[\cos u] = -(\sin u)u'$$

$$15. \frac{d}{dx}[\tan u] = (\sec^2 u)u'$$

$$16. \frac{d}{dx}[\cot u] = -(\csc^2 u)u'$$

$$17. \frac{d}{dx}[\sec u] = (\sec u \tan u)u'$$

$$18. \frac{d}{dx}[\csc u] = -(\csc u \cot u)u'$$

---

### Integration Rules:

**Power Rule:**  $\int u^n du = \frac{u^{n+1}}{n+1} + C$

**Natural Log Rule:**  $\int \frac{1}{u} du = \ln|u| + C$

$$3. \int du = u + C$$

$$4. \int a^u du = \left(\frac{1}{\ln a}\right)a^u + C$$

$$5. \int e^u du = e^u + C$$

$$6. \int \sin u du = -\cos u + C$$

$$7. \int \cos u du = \sin u + C$$

$$8. \int \tan u du = -\ln|\cos u| + C$$

$$9. \int \cot u du = \ln|\sin u| + C$$

$$10. \int \sec u du = \ln|\sec u + \tan u| + C$$

$$11. \int \csc u du = -\ln|\csc u + \cot u| + C$$

$$12. \int \sec^2 u du = \tan u + C$$

$$13. \int \csc^2 u du = -\cot u + C$$

$$14. \int \sec u \tan u du = \sec u + C$$

**Exponent & Log Properties:**

exponent properties:  $e^a e^b = e^{a+b}$      $\frac{e^a}{e^b} = e^{a-b}$      $\frac{d}{dx} e^u = e^u * u'$      $\frac{d}{dx} [\ln u] = \frac{u'}{u}$

$\ln(ab) = \ln a + \ln b$      $\ln\left(\frac{a}{b}\right) = \ln a - \ln b$      $\ln a^n = n \ln a$      $e^{\ln x} = x$      $\ln e^x = x$      $\ln e = 1$      $\ln 1 = 0$

**Antiderivative Steps:**

Integrals Checklist Order:

- 1) Expand/Power Rule   2) U-Sub/Change of Variable   3) Long Division/Synthetic Division**

Possible u-value locations:

- 1) exponent   2) value inside parentheses   3) denominator**

**Area/Volume Formulas:**

$$\text{Area} = \int_{x_1}^{x_2} (\text{Top graph} - \text{Bottom graph}) dx$$

---

Radius  $[R(x)] =$  distance from the AOR (Axis of Revolution) to the graph curve

**Disc Method:**  $\text{Volume} = \pi \int_{x_1}^{x_2} [R(x)]^2 dx$

---

Radius  $[R(x)] =$  distance from the AOR (Axis of Revolution) to the **further** graph curve

radius  $[r(x)] =$  distance from the AOR (Axis of Revolution) to the **closer** graph curve

**Washer Method:**  $\text{Volume} = \pi \int_{x_1}^{x_2} [R(x)]^2 - [r(x)]^2 dx$

---