AP Calculus AB — Activity 33 - Math Facts — Name:

Dr. Paul L. Bailey — Tuesday, March 17, 2020

Let a, b, c, d be fixed (constant) real numbers. Let u, v, and y be functions of x.

(1) $\frac{d}{dx}(au+bv) =$ $\underline{au' + bv'}$ (linearity)

(2) $\frac{d}{dx}(uv) =$ $\underline{u'v + uv'}$ (product rule)

(3) $\frac{d}{dx}\left(\frac{u}{v}\right) =$ $\underline{\dfrac{u'v - uv'}{v^2}}$ (quotient rule)

(4) $\frac{d}{dx}y(u) =$ $\underline{\dfrac{dy}{du} \cdot \dfrac{du}{dx}}$ (chain rule)

(5) $\frac{d}{dx}u^a =$ $\underline{au^{a-1}}$ $\cdot \frac{du}{dx}$

(6) $\frac{d}{dx}a^u =$ $\underline{\ln a \cdot a^u}$ $\cdot \frac{du}{dx}$, where $a > 0$

(7) $\frac{d}{dx}e^u =$ $\underline{e^u}$ $\cdot \frac{du}{dx}$

(8) $\frac{d}{dx}\ln(u) =$ $\underline{\dfrac{1}{u}}$ $\cdot \frac{du}{dx}$

(9) $\frac{d}{dx}\sin(u) =$ $\underline{\cos u}$ $\cdot \frac{du}{dx}$

(10) $\frac{d}{dx}\cos(u) =$ $\underline{-\sin u}$ $\cdot \frac{du}{dx}$

(11) $\frac{d}{dx}\tan(u) =$ $\underline{\sec^2 u}$ $\cdot \frac{du}{dx}$

(12) $\frac{d}{dx}\sec(u) =$ $\underline{\sec u \cdot \tan u}$ $\cdot \frac{du}{dx}$

(13) $\frac{d}{dx}\arcsin(u) =$ $\underline{\dfrac{1}{\sqrt{1-u^2}}}$ $\cdot \frac{du}{dx}$

(15) $\frac{d}{dx}\arctan(u) =$ $\underline{\dfrac{1}{1+u^2}}$ $\cdot \frac{du}{dx}$

(16) $\frac{d}{dx}\operatorname{arcsec}(u) =$ $\underline{\dfrac{1}{u\sqrt{u^2-1}}}$ $\cdot \frac{du}{dx}$

(17) $\int u^a \, du =$ $\underline{\dfrac{u^{a+1}}{a+1}}$ $+ C$, where $a \neq -1$

(18) $\int u^a \, du =$ $\underline{\ln u}$ $+ C$, where $a = -1$

(19) $\int a^u \, du =$ $\underline{\dfrac{a^u}{\ln a}}$ $+ C$, where $a > 0$

(20) $\int e^u \, du =$ $\underline{e^u}$ $+ C$

(21) $\int \sin(u) \, du =$ $\underline{-\cos u}$ $+ C$

(22) $\int \cos(u) \, du =$ $\underline{\sin u}$ $+ C$

(23) $\int \tan(u) \, du =$ $\underline{\ln(\sec u)}$ $+ C$

(24) $\int \sec^2(u) \, du =$ $\underline{\tan u}$ $+ C$

(25) $\int \csc^2(u) \, du =$ $\underline{-\cot}$ $+ C$

(26) $\int \tan^2(u) \, du =$ $\underline{\tan u + u}$ $+ C$

(27) $\int \sin^2(u) \, du =$ $\underline{\dfrac{u}{2} - \dfrac{\sin 2u}{4}}$ $+ C$

(28) $\int \cos^2(u) \, du =$ $\underline{\dfrac{u}{2} + \dfrac{\sin 2u}{4}}$ $+ C$

(29) $\int \sec(u) \tan(u) \, du =$ $\underline{\sec u}$ $+ C$

(30) $\int \dfrac{1}{\sqrt{1-u^2}} \, du =$ $\underline{\arcsin u}$ $+ C$

(31) $\int \dfrac{1}{1+u^2} \, du =$ $\underline{\arctan u}$ $+ C$

(32) $\int \dfrac{1}{|u|\sqrt{u^2-1}} \, du =$ $\underline{\operatorname{arcsec} u}$ $+ C$