AP Calculus Cheat Sheet

v1.6 (Condensed)

1 Derivatives

1.1 Using limits to calculate derivatives

$$\frac{d}{dx}f(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} \tag{1}$$

1.2 Utilities

Power rule:

$$\frac{d}{dx}x^n = nx^{n-1} \tag{2}$$

Chain rule:

$$\frac{d}{dx}(f(x) \circ g(x)) = f'(g(x)) * g'(x) \tag{3}$$

Derivatives of inverses

$$\frac{d}{dx}f^{-1}(x) = \frac{1}{f'(f^{-1}(x))} \tag{4}$$

Derivatives of logbase

$$\frac{d}{dx}\log_b x = \frac{1}{x} * \frac{1}{\ln b} \tag{5}$$

Derivative of a multiplier

$$\frac{d}{dx}cx = c \tag{6}$$

Derivative of natural log

$$\frac{d}{dx}\ln x = \frac{1}{x} \tag{7}$$

Derivative of multiplication

$$\frac{d}{dx}fg = f'g + fg' \tag{8}$$

Quotient Rule

$$\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{f'g - fg'}{g^2} \tag{9}$$

Tangent line equation

$$y - y_1 = m(x - x_1) \tag{10}$$

Definition of euler's number

$$e = \lim_{b\to\infty}(1 + \frac{1}{b})^b \tag{11}$$

Derivative of constant

$$\frac{d}{dx}c = 0 \tag{12}$$

Derivative of addition

$$\frac{d}{dx}[f(x) + g(x)] = f'(x) + g'(x) \tag{13}$$

Derivative of function multiplied by a constant

$$\frac{d}{dx}c * f(x) = c * f'(x) \tag{14}$$

Derivative of a^x

$$\frac{d}{dx}a^x = a^x * \ln a \tag{15}$$

2   Identities

Trig Identities

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \tag{16}$$

Derivative of

$$\frac{d}{dx} \tag{17}$$

Derivative of cosine

$$\frac{d}{dx}\cos x = -\sin x \tag{18}$$

Derivative of sine
$$\frac{d}{dx} \sin x = \cos x \tag{19}$$

Derivative of tangent
$$\frac{d}{dx} \tan x = \sec^2 x \tag{20}$$

Derivative of cotangent
$$\frac{d}{dx} \cot x = \csc^2 x \tag{21}$$

Derivative of secant
$$\frac{d}{dx} \sec x = \sec x \tan x \tag{22}$$

Derivative of cosecant
$$\frac{d}{dx} \csc x = -\csc x \cot x \tag{23}$$

Derivative of inverse sine
$$\frac{d}{dx} \sin^{-1} x = \frac{1}{\sqrt{1-x^2}} \tag{24}$$

Derivative of inverse tangent
$$\frac{d}{dx} \tan^{-1} x = \frac{1}{1+x^2} \tag{25}$$

Pythagorean theorem with sin/cos
$$\sin^2(x) + \cos^2(x) = 1 \tag{26}$$

Rules of logarithms
$$log_b(b^x) = xb^{(log_b \ x)} = xlog_b \ a^n = n \cdot log_b \ a \tag{27}$$

Rules of exponents
$$\begin{aligned}
\left(\frac{a}{b}\right)^n &= \frac{a^n}{b^n} \\
(x^a)^b &= x^{ab} \\
x^a \cdot x^b &= x^{a+b} \\
x^{-n} &= \frac{1}{x^n}
\end{aligned} \tag{28}$$

$$\frac{a}{x} \cdot \frac{b}{x} \cdot \frac{c}{x} \cdot \ ... \ = (a \cdot b \cdot c \cdot ...)^{1/x}$$