MATH 16B Review Sheet

I) Basic Differentiation Formulas

A) Power Rule

$$D_x(x^r) = r x^{r-1}$$ for any number r

B) Product Rule

$$D_x(f(x)g(x)) = f(x)g'(x) + g(x)f'(x)$$ OR $$(uv)' = uv' + vu'$$

C) Quotient Rule

$$D_x\left(\frac{f(x)}{g(x)}\right) = \frac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2}$$ OR $$\left(\frac{u}{v}\right)' = \frac{vu' - uv'}{v^2}$$

D) Chain Rule

$$(f \circ g)'(x) = f'(g(x))\,g'(x)$$ OR $$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

E) General Power Rule

$$D_x((g(x))^r) = r(g(x))^{r-1} \cdot g'(x)$$ OR $$\frac{d}{dx}(u^r) = r u^{r-1} \cdot \frac{du}{dx}$$ for any number r

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II) Trig Derivatives

A)
$$D_x(\sin x) = \cos x$$
$$D_x(\cos x) = -\sin x$$

B)
$$D_x(\tan x) = \sec^2 x$$
$$D_x(\cot x) = -\csc^2 x$$

C)
$$D_x(\sec x) = \sec x \tan x$$
$$D_x(\csc x) = -\csc x \cot x$$

III) Trig Identities

A)
$$\sin^2\theta + \cos^2\theta = 1$$
$$\tan^2\theta + 1 = \sec^2\theta$$
$$\cot^2\theta + 1 = \csc^2\theta$$

B)
$$\tan\theta = \frac{\sin\theta}{\cos\theta} \qquad \sec\theta = \frac{1}{\cos\theta}$$
$$\cot\theta = \frac{\cos\theta}{\sin\theta} \qquad \csc\theta = \frac{1}{\sin\theta}$$

C)
$$\cos^2\theta = \frac{1}{2}(1 + \cos 2\theta)$$
$$\sin^2\theta = \frac{1}{2}(1 - \cos 2\theta)$$

D)
$$\cos 2\theta = \cos^2\theta - \sin^2\theta$$
$$\sin 2\theta = 2\sin\theta\cos\theta$$