

Pop Quiz Content

- ① SIX TRIG DERIV.
② DIFFERENTIATION FORMULAS

a) PRODUCT RULE

$$\frac{d}{dx}(f(x)g(x)) = f(x)g'(x) + g(x)f'(x)$$

b) QUOTIENT RULE

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

CHAIN RULE

$$c) \frac{d}{dx}(f(g(x))) = f'(g(x)) \cdot g'(x)$$

③ Tangent and Cotangent Identities

$$\tan \theta = \frac{\sin \theta}{\cos \theta} \quad \cot \theta = \frac{\cos \theta}{\sin \theta}$$

④ Reciprocal Identities

$$\csc \theta = \frac{1}{\sin \theta} \quad \sin \theta = \frac{1}{\csc \theta}$$

$$\sec \theta = \frac{1}{\cos \theta} \quad \cos \theta = \frac{1}{\sec \theta}$$

$$\cot \theta = \frac{1}{\tan \theta} \quad \tan \theta = \frac{1}{\cot \theta}$$

⑤ Pythagorean Identities

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\tan^2 \theta + 1 = \sec^2 \theta$$

$$1 + \cot^2 \theta = \csc^2 \theta$$

NUMERICAL DERIVATIVES

① IF $h(x) = f(x) - g(x)$

FIND $h'(4)$.

$$h'(x) = f'(x) - g'(x)$$

$$h'(4) = f'(4) - g'(4)$$

$$= 8 - 4$$

$$= 4$$

x	f	f'	g	g'
2	4	6	8	2
4	6	8	2	4
6	8	2	4	6
8	2	4	6	8

x	f	f'	g	g'
2	4	6	8	2
4	6	8	2	4
6	8	2	4	6
8	2	4	6	8

$$② h(x) = \underbrace{x^2 f(x)}_{\text{PRODUCT RULE}} + \underbrace{\frac{1}{g(x)}}_{\text{QUOTIENT}}$$

$$h' = x^2 f'(x) + 2x f(x) + \frac{g(x)(0) - 1(g'(x))}{(g(x))^2}$$

$$h'(2) = 2^2 \cdot f'(2) + 2(2) \cdot f(2) + \frac{-1(g'(2))}{(g(2))^2}$$

$$= 4(6) + 4(4) + \frac{-2}{8^2}$$

$$= 40 - \frac{1}{32} = \boxed{39 \frac{31}{32}}$$

$$③ h(x) = f(g(x)) \quad h'(6) = ?$$

CHAIN RULE

$$h' = f'(g(x)) \cdot g'(x) \Big|_{x=6}$$

$$= f'(g(6)) g'(6)$$

$$= f'(4) \cdot 6$$

$$= 8 \cdot 6$$

$$= 48$$

x	f	f'	g	g'
2	4	6	8	2
4	6	8	2	4
6	8	2	4	6
8	2	4	6	8

x	f	f'	g	g'
2	4	6	8	2
4	6	8	2	4
6	8	2	4	6
8	2	4	6	8

$$f(g(2))$$

$$f'(8)$$

$$2$$

$$\textcircled{4} \quad w(x) = f(f(x)) - \frac{1}{g(x)} \quad w(8) = ?$$

$$w(x) = f(f(x)) - (g(x))^{-1}$$

$$w'(x) = f'(f(x)) \cdot f'(x) + 1 (g(x)) \cdot g'(x)^{-2}$$

$$w'(8) = f'(f(8)) f'(8) + (g(8))^{-2} g'(8)$$

$$= f'(2) f'(8) + (6)^{-2} g'(8)$$

$$= (6)(4) + \frac{1}{36} \cdot 8$$

$$= 24 + \frac{2}{9}$$

$$= \boxed{24\frac{2}{9}}$$

x	f	f'	g	g'
2	4	6	8	2
4	6	8	2	4
6	8	2	4	6
8	2	4	6	8

$$\textcircled{5} \quad a(x) = g(f(g(x))) \quad a'(2) = ?$$

$$a'(x) = g'(f(g(x))) f'(g(x)) \cdot g'(x)$$

$$a'(2) = g'(f(g(2))) f'(g(2)) g'(2)$$

$$= g'(f(8)) f'(8) g'(2)$$

$$= g'(2) f'(8) g'(2)$$

$$= 2 \cdot 4 \cdot 2$$

$$= 16$$

$$\textcircled{6} \quad h(x) = f^3(x) \quad h'(4) = ?$$

$$h' = 3(f(x))^2 \cdot f'(x)$$

$$h'(4) = 3(f(4))^2 \cdot f'(4)$$

$$= 3(6)^2 \cdot 8$$

$$= \boxed{864}$$