Calculus Practice: Chain Rule 3a

Differentiate each function with respect to *x*.

1) $f(x) = \sin x^5$

A) $f'(x) = \tan x^5 \cdot 5x^4$
$= 5x^4 \tan x^5$

B) $f'(x) = -\cos x^5 \cdot 5x^4$
$= -5x^4 \cos x^5$

C) $f'(x) = \cos x^5 \cdot 5x^4$
$= 5x^4 \cos x^5$

D) $f'(x) = \sec x^5 \cdot 5x^4$
$= 5x^4 \sec x^5$

2) $f(x) = \sin 5x^3$

A) $f'(x) = \sec 5x^3 \cdot 15x^2$
$= 15x^2 \sec 5x^3$

B) $f'(x) = \cos 5x^3 \cdot 15x^2$
$= 15x^2 \cos 5x^3$

C) $f'(x) = \tan 5x^3 \cdot 15x^2$
$= 15x^2 \tan 5x^3$

D) $f'(x) = -\cos 5x^3 \cdot 15x^2$
$= -15x^2 \cos 5x^3$

3) $y = \cos 3x^3$

A) $\frac{dy}{dx} = -\sin 3x^3 \cdot 9x^2$
$= -9x^2 \sin 3x^3$

B) $\frac{dy}{dx} = \sin 3x^3 \cdot 9x^2$
$= 9x^2 \sin 3x^3$

C) $\frac{dy}{dx} = -\csc 3x^3 \cdot 9x^2$
$= -9x^2 \csc 3x^3$

D) $\frac{dy}{dx} = -\cot 3x^3 \cdot 9x^2$
$= -9x^2 \cot 3x^3$

4) $f(x) = \cos(\sin 4x^2)$

A) $f'(x) = -\sin(\sin 4x^2) \cdot \cos 4x^2 \cdot 8x$
$= -8x\sin(\sin 4x^2)\cos 4x^2$

B) $f'(x) = -\csc(\sin 4x^2) \cdot \cos 4x^2 \cdot 8x$
$= -8x\csc(\sin 4x^2)\cos 4x^2$

C) $f'(x) = -\cot(\sin 4x^2) \cdot \cos 4x^2 \cdot 8x$
$= -8x\cot(\sin 4x^2)\cos 4x^2$

D) $f'(x) = \sin(\sin 4x^2) \cdot \cos 4x^2 \cdot 8x$
$= 8x\sin(\sin 4x^2)\cos 4x^2$

5) $y = \cos(\sin x^5)$

A) $\frac{dy}{dx} = -\sin(\sin x^5) \cdot \cos x^5 \cdot 5x^4$
$= -5x^4 \sin(\sin x^5)\cos x^5$

B) $\frac{dy}{dx} = \sin(\sin x^5) \cdot \cos x^5 \cdot 5x^4$
$= 5x^4 \sin(\sin x^5)\cos x^5$

C) $\frac{dy}{dx} = -\csc(\sin x^5) \cdot \cos x^5 \cdot 5x^4$
$= -5x^4 \csc(\sin x^5)\cos x^5$

D) $\frac{dy}{dx} = -\cot(\sin x^5) \cdot \cos x^5 \cdot 5x^4$
$= -5x^4 \cot(\sin x^5)\cos x^5$

6) $f(x) = \sin(\sin 4x^5)$

A) $f'(x) = \tan(\sin 4x^5) \cdot \cos 4x^5 \cdot 20x^4$
$= 20x^4 \tan(\sin 4x^5) \cos 4x^5$

B) $f'(x) = \sec(\sin 4x^5) \cdot \cos 4x^5 \cdot 20x^4$
$= 20x^4 \sec(\sin 4x^5) \cos 4x^5$

C) $f'(x) = \cos(\sin 4x^5) \cdot \cos 4x^5 \cdot 20x^4$
$= 20x^4 \cos(\sin 4x^5) \cos 4x^5$

D) $f'(x) = -\cos(\sin 4x^5) \cdot \cos 4x^5 \cdot 20x^4$
$= -20x^4 \cos(\sin 4x^5) \cos 4x^5$

7) $f(x) = \sin 2x^2 \cdot (4x^5 + 1)$

A) $f'(x) = \cos 2x^2 \cdot 4x \cdot 20x^4 + \cos 2x^2 \cdot 4x \cdot 20x^4$
$= 160x^5 \cos 2x^2$

B) $f'(x) = \sin 2x^2 \cdot 20x^4$
$= 20x^4 \sin 2x^2$

C) $f'(x) = \cos 2x^2 \cdot 4x + 20x^4$
$= 4x(\cos 2x^2 + 5x^3)$

D) $f'(x) = \sin 2x^2 \cdot 20x^4 + (4x^5 + 1) \cdot \cos 2x^2 \cdot 4x$
$= 4x(5x^3 \sin 2x^2 + 4x^5 \cos 2x^2 + \cos 2x^2)$

8) $f(x) = \dfrac{-4x^3 + 3}{\sin 3x^4}$

A) $f'(x) = \sin 3x^4 \cdot -12x^2 - (-4x^3 + 3) \cdot \cos 3x^4 \cdot 12x^3$
$= 12x^2(-\sin 3x^4 + 4x^4 \cos 3x^4 - 3x \cos 3x^4)$

B) $f'(x) = \dfrac{\sin 3x^4 \cdot -12x^2 - (-4x^3 + 3) \cdot \cos 3x^4 \cdot 12x^3}{(-4x^3 + 3)^2}$
$= \dfrac{12x^2(-\sin 3x^4 + 4x^4 \cos 3x^4 - 3x \cos 3x^4)}{(-4x^3 + 3)^2}$

C) $f'(x) = \dfrac{\sin 3x^4 \cdot -12x^2 - (-4x^3 + 3) \cdot \cos 3x^4 \cdot 12x^3}{\sin^2 3x^4}$
$= \dfrac{12x^2(-\sin 3x^4 + 4x^4 \cos 3x^4 - 3x \cos 3x^4)}{\sin^2 3x^4}$

D) $f'(x) = \dfrac{\sin 3x^4 \cdot -12x^2 - (-4x^3 + 3) \cdot \cos 3x^4 \cdot 12x^3}{\sin 3x^4}$
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*C) $f'(x) = \cos x^5 \cdot 5x^4 = 5x^4 \cos x^5$

D) $f'(x) = \sec x^5 \cdot 5x^4 = 5x^4 \sec x^5$

2) $f(x) = \sin 5x^3$

A) $f'(x) = \sec 5x^3 \cdot 15x^2 = 15x^2 \sec 5x^3$

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$= 20x^4 \cos(\sin 4x^5)\cos 4x^5$

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B) $f'(x) = \dfrac{\sin 3x^4 \cdot -12x^2 - (-4x^3 + 3) \cdot \cos 3x^4 \cdot 12x^3}{(-4x^3 + 3)^2}$
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*C) $f'(x) = \dfrac{\sin 3x^4 \cdot -12x^2 - (-4x^3 + 3) \cdot \cos 3x^4 \cdot 12x^3}{\sin^2 3x^4}$
$= \dfrac{12x^2(-\sin 3x^4 + 4x^4 \cos 3x^4 - 3x \cos 3x^4)}{\sin^2 3x^4}$

D) $f'(x) = \dfrac{\sin 3x^4 \cdot -12x^2 - (-4x^3 + 3) \cdot \cos 3x^4 \cdot 12x^3}{\sin 3x^4}$
$= \dfrac{12x^2(-\sin 3x^4 + 4x^4 \cos 3x^4 - 3x \cos 3x^4)}{\sin 3x^4}$