1. Find $\lim_{x\to 0} \frac{2x}{\sin(6x)}$.

$$\lim_{x\to 0} \frac{2x}{\sin(6x)} \cdot \frac{3}{3} = \lim_{x\to 0} \frac{6x}{\sin(6x)} \cdot \frac{1}{3}$$

+4

$$= 1 \cdot \frac{1}{3}$$

$$= \frac{1}{3}$$

2. Differentiate $z = \frac{C}{y^8} + D\tan(y)$.

$$z = C y^{-8} + D\tan(y)$$

$$z' = -8C y^{-9} + D\sec^2(y)$$

+4

3. Differentiate $f(t) = \sqrt{1+3e^{4t}}$.

$f(t) = \sqrt{t}$ $\quad g(t) = 1+3e^{4t}$

$f'(t) = \frac{1}{2\sqrt{t}}$ $\quad g'(t) = 3\cdot 4e^{4t}$

$= 12e^{4t}$

$$f'(t) = \frac{1}{2\sqrt{1+3e^{4t}}} \cdot 12e^{4t}$$

+4

$$= \frac{6e^{4t}}{\sqrt{1+3e^{4t}}}$$

4. Find dy/dx by implicit differentiation: $\sin(xy) = 1 + xy^2$.

$\cos(xy)\left(x \cdot y' + y \cdot 1\right) = x \cdot 2yy' + y^2 \cdot 1$

$xy'\cos(xy) + y\cos(xy) = 2xyy' + y^2$

$xy'\cos(xy) - 2xyy' = y^2 - y\cos(xy)$

$y'\left(x\cos(xy) - 2xy\right) = y^2 - y\cos(xy)$

+4

$$y' = \frac{y^2 - y\cos(xy)}{x\cos(xy) - 2xy}$$

5. Find $\lim_{x\to\infty}(\sqrt{4x^2+1} - 2x)$.

$$\lim_{x\to\infty} (\sqrt{4x^2+1} - 2x) \cdot \frac{(\sqrt{4x^2+1} + 2x)}{(\sqrt{4x^2+1} + 2x)}$$

+4

$$= \lim_{x\to\infty} \frac{4x^2+1-4x^2}{\sqrt{4x^2+1} + 2x}$$

$$= \lim_{x\to\infty} \frac{1}{\sqrt{4x^2+1} + 2x}$$

$= 0$