

## Quiz 5, Solution

$$1. \lim_{s \rightarrow 0} \frac{\sin(s^2-7s)}{s} = \lim_{s \rightarrow 0} \frac{\sin(s^2-7s)}{(s^2-7s)} \cdot \frac{s^2-7s}{s} = \lim_{s \rightarrow 0} \frac{\sin(s^2-7s)}{(s^2-7s)} \cdot \lim_{s \rightarrow 0} (s-7)$$
$$= 1 \cdot (-7) = -7$$

$$\lim_{s \rightarrow 0} \frac{\sin(s^2+2s)}{\sin s} = \lim_{s \rightarrow 0} \frac{\sin(s^2+2s)}{(s^2+2s)} \cdot \frac{s^2+2s}{s} \cdot \frac{s}{\sin s}$$
$$= \lim_{s \rightarrow 0} \frac{\sin(s^2+2s)}{(s^2+2s)} \cdot \lim_{s \rightarrow 0} \frac{s^2+2s}{s} \cdot \lim_{s \rightarrow 0} \frac{s}{\sin s} = 1 \cdot 2 \cdot 1 = 2$$

$$\text{So } \lim_{s \rightarrow 0} \left[ \frac{\sin(s^2-7s)}{s} + \frac{\sin(s^2+2s)}{\sin s} \right] = -7 + 2 = -5$$

2. Take  $u = 5 \sin y$ , then  $f(y) = 3 \tan u$

$$\text{By the chain rule, } \frac{df}{dy} = \frac{df}{du} \cdot \frac{du}{dy} = \frac{d}{du} (3 \tan u) \cdot \frac{d}{dy} (5 \sin y)$$
$$= 3 \sec^2 u \cdot 5 \cos y = 15 \sec^2(5 \sin y) \cdot \cos y$$