1. Evaluate:

$$\lim_{x\to 0}\frac{\sin(2x)}{x}$$

Solution. We know the limit of $\frac{\sin(x)}{x}$ is 1 as $x \to 0$, and as a consequence we know the limit of $\frac{\sin(2x)}{2x}$ is 1 as $x \to 0$ as well. Thus

$$\begin{aligned}\lim_{x\to 0}\frac{\sin(2x)}{x} &= \lim_{x\to 0}\frac{\sin(2x)}{2x}\cdot\frac{2}{1}\\ &= 1\cdot\frac{2}{1}\\ &= 2.\end{aligned}$$

$$\boxed{2}$$

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2. Find the second derivative of $g(x) = x^3 - 3x^2 + 3x - 1$.

Solution. We take the derivative of g twice.

$$\begin{aligned}g'(x) &= \frac{d}{dx}g(x)\\ &= \frac{d}{dx}(x^3 - 3x^2 + 3x - 1)\\ &= 3x^2 - 6x + 3 \implies\\ g''(x) &= \frac{d}{dx}g'(x)\\ &= \frac{d}{dx}(3x^2 - 6x + 3)\\ &= 6x - 6.\end{aligned}$$

$$\boxed{6x - 6}$$

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3. Find the derivative of $f(x) = \tan(x)\sin(x)$.

Solution. We use the product rule:

$$\begin{aligned} f'(x) &= \tan(x)\,\frac{d}{dx}(\sin(x)) + \frac{d}{dx}(\tan(x))\,\sin(x) \\ &= \tan(x)\cos(x) + \sec^2(x)\sin(x) \\ &= \boxed{\sin(x) + \sec(x)\tan(x)} \\ &= \boxed{\frac{\sin(x)(\cos^2(x)+1)}{\cos^2(x)}} \\ &= \boxed{\sin(x)(1+\sec^2(x))}. \end{aligned}$$