Answers for class prep quiz on section 3.3, Stewart's Calculus (8th ed.)

1. **Answer:** (a). Remember, the co-functions ($\cos x$, $\cot x$, $\csc x$) have $-$ signs in the formulas for their derivatives, and the other three functions ($\sin x$, $\tan x$, $\sec x$) have $+$ signs.

2. **Answer:** (c). Using the trig identity $\cos^2 x + \sin^2 x = 1$,

$$\begin{aligned} f'(x) &= \frac{(\cos x)\dfrac{d}{dx}(\sin x) - (\sin x)\dfrac{d}{dx}(\cos x)}{\cos^2 x} \\ &\quad - \frac{(\sin x)\dfrac{d}{dx}(\cos x) - (\cos x)\dfrac{d}{dx}(\sin x)}{\sin^2 x} \\ &= \frac{(\cos x)(\cos x) - (\sin x)(-\sin x)}{\cos^2 x} \\ &\quad - \frac{(\sin x)(-\sin x) - (\cos x)(\cos x)}{\sin^2 x} \\ &= \frac{\cos^2 x + \sin^2 x}{\cos^2 x} - \frac{-\sin^2 x - \cos^2 x}{\sin^2 x} \\ &= \frac{1}{\cos^2 x} + \frac{1}{\sin^2 x} \\ &= \frac{\sin^2 x + \cos^2 x}{\cos^2 x \sin^2 x} = \frac{1}{\cos^2 x \sin^2 x} = \sec^2 x \csc^2 x. \end{aligned}$$

   The first few steps can be skipped if you remember that $\tan x = \dfrac{\sin x}{\cos x}$ and $\cot x = \dfrac{\cos x}{\sin x}$.

3. **Answer:** (c). $g(x) = x^{1/3}\cos x$, so by the product rule,

$$g'(x) = (1/3)x^{-2/3}\cos x + x^{1/3}(-\sin x) = \frac{\cos x}{3x^{2/3}} - \sqrt[3]{x}\sin x.$$

4. **Answer:** (b). Since $\dfrac{dy}{dx} = 13\cos x$, the tangent line at $x = 7$ has slope $13\cos 7$ and passes through the point $(7, 13\sin 7 - 11)$. Therefore, by point-slope, the equation of the tangent line is

$$y - (13\sin 7 - 11) = (13\cos 7)(x - 7).$$