6.5

33. $f'(x) = \frac{d}{dx}\sin^{-1}3x = \frac{1}{\sqrt{1-(3x)^2}} \cdot \frac{d}{dx}(3x) = \frac{3}{\sqrt{1-9x^2}}$

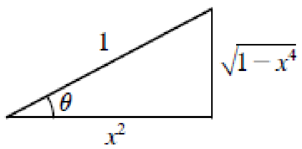
37. $g'(t) = \frac{d}{dt}\left[t\tan^{-1}3t\right] = \tan^{-1}3t + t \cdot \frac{\frac{d}{dt}(3t)}{1+(3t)^2} = \tan^{-1}3t + \frac{3t}{1+9t^2}$

41. $h'(x) = \frac{d}{dx}\left(\sin^{-1}x + 2\cos^{-1}x\right) = \frac{1}{\sqrt{1-x^2}} + \frac{-2}{\sqrt{1-x^2}} = -\frac{1}{\sqrt{1-x^2}}$

53. Let $\theta = \cos^{-1}x^2$. Then $\cos\theta = x^2$, so

$$h(x) = \cot\left(\cos^{-1}x^2\right) = \cot\theta = \frac{x^2}{\sqrt{1-x^4}} \Rightarrow$$

$$h'(x) = \frac{\left(1-x^4\right)^{1/2}(2x) - x^2\left(\frac{1}{2}\right)\left(1-x^4\right)^{-1/2}\left(-4x^3\right)}{1-x^4} = \frac{2x}{\left(1-x^4\right)^{3/2}}.$$



54. $y' = \frac{d}{dx}\sin^{-1}\left(\frac{\sin x}{1+\cos x}\right) = \frac{\frac{d}{dx}\left(\frac{\sin x}{1+\cos x}\right)}{\sqrt{1-\left(\frac{\sin x}{1+\cos x}\right)^2}} = \frac{\frac{(1+\cos x)(\cos x) - \sin x(-\sin x)}{(1+\cos x)^2}}{\frac{\sqrt{2\cos x + 2\cos^2 x}}{1+\cos x}} = \frac{1}{\sqrt{2\cos x + 2\cos^2 x}}$

6.7

12. $\lim_{\theta\to 0} \frac{\theta + \sin\theta}{\tan\theta} = \lim_{\theta\to 0} \frac{1+\cos\theta}{\sec^2\theta} = \frac{2}{1} = 2$

21. $\lim_{x\to -1} \frac{\sqrt{x+2}+x}{\sqrt[3]{2x+1}+1} = \lim_{x\to -1} \frac{\frac{1}{2}(x+2)^{-1/2}+1}{\frac{2}{3}(2x+1)^{-2/3}} = \frac{\frac{1}{2}+1}{\frac{2}{3}} = \frac{9}{4}$

25. $\lim_{x\to 0} \frac{\sin x - x}{e^x - e^{-x} - 2x} = \lim_{x\to 0} \frac{\cos x - 1}{e^x + e^{-x} - 2} = \lim_{x\to 0} \frac{-\sin x}{e^x - e^{-x}} = -\lim_{x\to 0} \frac{\cos x}{e^x + e^{-x}} = -\frac{1}{2}$

31. $\lim_{x\to 0} \frac{(\sin x)^2}{1-\sec x} = -\lim_{x\to 0} \frac{2\sin x\cos x}{\sec x\tan x} = -\lim_{x\to 0} \frac{2\sin x\cos x}{\frac{\sin x}{\cos^2 x}} = -\lim_{x\to 0} 2\cos^3 x = -2$

37. $\lim_{x\to 1} \left(\frac{1}{\ln x} - \frac{1}{x-1}\right) = \lim_{x\to 1} \frac{x-1-\ln x}{(x-1)\ln x} = \lim_{x\to 1} \frac{1-\frac{1}{x}}{\ln x + \frac{x-1}{x}} = \lim_{x\to 1} \frac{x-1}{x\ln x + x - 1} = \lim_{x\to 1} \frac{1}{\ln x + x\left(\frac{1}{x}\right)+1} = \frac{1}{2}$