Homework #6 Answer Key

1. $$f'(x) = \boxed{\dfrac{\sec(4x)\cdot 9\left(\cos x - \frac{1}{\sqrt{x}}\right)^{8}\cdot\left(-\sin x + \frac{1}{2}x^{-3/2}\right) - \left(\cos x - \frac{1}{\sqrt{x}}\right)^{9}\cdot \sec(4x)\tan(4x)\cdot 4}{\left(\sec(4x)\right)^{2}}}$$

2. $$y' = 3\left(\sin(x^3)\right)^2\cdot\cos(x^3)\cdot 3x^2$$

3. $$y' = \boxed{3\left(\tan\sqrt{x^9-\cos x}\right)^2\cdot\sec^2\sqrt{x^9-\cos x}\cdot\frac{1}{2\sqrt{x^9-\cos x}}\cdot\left(9x^8+\sin x\right)}$$

4. $$f'(t) = \boxed{t^2\cdot 5\left(\sin(2t)\right)^4\cdot\cos(2t)\cdot 2 + \sin^5(2t)\cdot(2t)}$$

5. $$g'(x) = \boxed{\dfrac{\sin(4x)\cdot\left(-\sin(3x)\right)\cdot 3 - \cos(3x)\cos(4x)\cdot 4}{\sin^2(4x)}}$$

6. $$g'(t) = \boxed{-\sin\left(\sin^3\left(\frac{t}{\sqrt{t+1}}\right)\right)\cdot 3\left(\sin\left(\frac{t}{\sqrt{t+1}}\right)\right)^2\cdot\cos\left(\frac{t}{\sqrt{t+1}}\right)\cdot\left(\frac{\sqrt{t+1}\,(1) - t\cdot\frac{1}{2\sqrt{t+1}}\cdot(1)}{\underbrace{\left(\sqrt{t+1}\right)^2}_{t+1}}\right)}$$

7. $$g'(x) = \frac{1}{2}\left(\cos(x^2-\sin x)\right)^{-1/2}\cdot\left(-\sin(x^2-\sin x)\right)\cdot(2x-\cos x)$$

8. $$g'(x) = \boxed{\cos\sqrt{x^2+\sec x}\cdot\frac{1}{2}\left(x^2+\sec x\right)^{-1/2}\cdot\left(2x+\sec x\cdot\tan x\right)}$$

9. $$f'(x) = \boxed{-\left(\tan(\sqrt{x}+\cos x)\right)^{-2}\cdot\sec^2\left(\sqrt{x}+\cos x\right)\cdot\left(\frac{1}{2\sqrt{x}}-\sin x\right)}$$

10. $g'(0) = 4$

11. $H'\left(\frac{\pi}{3}\right) = 2\sqrt{3}$ and $H'\left(\frac{\pi}{8}\right) = \boxed{-4}$

12. $f'\left(\frac{\pi}{12}\right) = -5\sqrt{3}$

13. $\frac{dy}{dx} = \frac{\sec x \tan x - y\cos(xy)}{x\cos(xy) + 1}$

14. <u>Answer</u> The runners are moving $\frac{507}{25}$ yards per second at that moment.

15. $s(t) = \frac{t^3}{6} - \cos t + 3t - 1$ feet

16. $f(x) = \tan x - \sqrt{3}\cos x + \frac{9\sqrt{3}}{2}$

17. $\frac{2}{3}x^{3/2} + \sqrt{x} + C$

18. $\frac{7}{18}x^{18/7} + \frac{14}{15}x^{\frac{15}{14}} + C$

19. $\frac{2}{7}x^{7/2} + \frac{2}{5}x^{5/2} - 2x^{-1/2} - \frac{2}{3}x^{-3/2} + C$

20. $\frac{8}{14}x^2 + \frac{7}{8}x - 8x^{1/8} + \frac{7}{15}x^{15/7} - 49x^{-\frac{1}{7}} - \frac{64}{15}x^{15/8} + C$