AP Calculus Exam Prep Assignment #9 KEY

Multiple Choice

1)

$$u = 2x - 1 \Rightarrow x = \frac{u+1}{2} \Rightarrow y = \left(\frac{u+1}{2}\right)^2 + 2$$

$$\frac{dy}{du} = 2\left(\frac{u+1}{2}\right)\left(\frac{1}{2}\right) = \frac{u+1}{2} = \frac{(2x-1)+1}{2} = x$$

D)

2) $f'(x) = \dfrac{1(x+1) - 1(x-1)}{(x+1)^2} = \dfrac{2}{(x+1)^2} \Rightarrow f'(1) = \dfrac{2}{(1+1)^2} = \dfrac{1}{2}$ **D)**

3) $\dfrac{dy}{dx} = 2\cos 3x(-\sin 3x)(3) = -6\cos 3x \sin 3x$ **A)**

4) $h'(x) = 2f(x)\left[f'(x)\right] - 2g(x)\left[g'(x)\right] = 2f(x)\left[-g(x)\right] - 2g(x)\left[f(x)\right] = -4f(x)g(x)$ **C)**

5)

$$\frac{d^2}{dx^2}(f(x^3)) = \frac{d}{dx}\left(3x^2 f'(x^3)\right) = 6xf'(x^3) + 3x^2\left(\frac{d}{dx}f'(x^3)\right) = 6xg(x^3) + 3x^2\left(\frac{d}{dx}g(x^3)\right)$$

$$= 6xg(x^3) + 3x^2\left(3x^2 f(x^6)\right) = 6xg(x^3) + 9x^4 f(x^6)$$

D)

6) $A = \pi r^2 \quad \dfrac{dA}{dt} = 2\pi r\dfrac{dr}{dt} \quad \dfrac{dA}{dt} = 2\dfrac{dr}{dt} \quad 2\dfrac{dr}{dt} = 2\pi r\dfrac{dr}{dt} \Rightarrow r = \dfrac{1}{\pi}$ **C)**

7) $A = 6x^2 \quad \dfrac{dA}{dt} = 12x\dfrac{dx}{dt} \quad \dfrac{dA}{dt} = 6\dfrac{dx}{dt} \quad 6\dfrac{dx}{dt} = 12x\dfrac{dx}{dt} \Rightarrow x = \dfrac{1}{2}$ **E)**

8) $\dfrac{dr}{dt} = 0.3 \quad \dfrac{dV}{dt} = 4\pi r^2\dfrac{dr}{dt} \quad \dfrac{dV}{dt} = (100\pi)(0.3) = 30\pi$ **E)**

9) [GC] The figure shows a 16-foot ladder leaning against a wall. The tip of the ladder is sliding down the wall at the rate of 5.6 feet per second. What is the rate of change, in radians per second, of the angle A at the instant when the tip of the ladder is 7.0 feet above the ground?

$$\sin A = \frac{y}{16} \Rightarrow y = 16\sin A \Rightarrow \frac{dy}{dt} = 16\cos A\left(\frac{dA}{dt}\right)$$

$$-5.6 = 16\left(\frac{\sqrt{207}}{16}\right)\frac{dA}{dt} \Rightarrow \frac{dA}{dt} = \frac{-5.6}{\sqrt{207}} \approx -0.389$$

C)