AP Calculus AB

FTC - Part 2

1) $y = \int_0^x (\sin^2 t)\,dt$

$\frac{dy}{dx} = \sin^2 x$

2) $F(x) = \int_2^x (3t + \cos t^2)\,dt$

$F'(x) = 3x + \cos x^2$

3) $g(x) = \int_x^6 \ln(1+t^2)\,dt$

$g'(x) = -\ln(1+x^2)$

4) $F(x) = \int_x^7 \sqrt{2t^4+t+1}\,dt$

$F'(x) = -\sqrt{2x^4+x+1}$

5) $y = \int_{x^3}^5 \frac{5\cos t}{t^2+2}\,dt$

$\frac{dy}{dx} = -\frac{\cos x^3}{x^6+2} \cdot 3x^2$

6) $y = \int_{\sin x}^{\cos x} t^2\,dt$

$y' = (\cos x)^2 \cdot (-\sin x) - (\sin x)^2 \cos x$

7) $g(x) = \int_0^x f(t)\,dt \qquad g(-1) = \int_0^{-1} f(t)\,dt = -\frac{3}{2}$

$g'(x) = f(x) \qquad g'(-1) = f(-1) = 0$

$g'(x) = f''(x) \qquad g''(-1) = f'(-1) = 3$

8) $g(x) = 2x + \int_0^x f(t)\,dt \qquad g'(x) = 2 + f(x)$

$g(-3) = -6 + \int_0^{-3} f(t)\,dt \qquad g'(-3) = 2 + f(-3)$

$-6 - \frac{1}{4}\pi(9) \qquad = 2 + 0$

$-6 - \frac{9}{4}\pi \qquad = 2$

9) $g(x) = 5 + \int_0^x g'(x)\,dx$

a) $g'(0) = 2$ b) $g''(0) = 0$

10) $g(x) = \int_0^x f(t)\,dt$

$g(4) = \int_0^4 f(t)\,dt$

$= 3$

$g'(x) = f(x)$

$g'(4) = f(4) = 0$

$g''(x) = f'(x)$

$g''(4) = f'(4) = -2$

11) $\lim_{x \to 0} \frac{1-\cos x}{2\sin^2 x} \to \frac{0}{0}$

Using L'Hopital's Rule

$\lim_{x \to 0} \frac{\sin x}{4\sin x \cos x}$

$\lim_{x \to 0} \frac{1}{4\cos x} = \frac{1}{4}$

12) $y = \frac{2x+3}{3x-2}$

$y' = \frac{(3x-2)(2)-(2x+3)(3)}{(3x-2)^2}$

$y'\Big|_{x=1} = \frac{(1)(2)-(5)(3)}{(1)^2} = -13$

Tangent: $y-5=-13(x-1)$