AP Calculus AB WS 41 - Review #1

1) $f(x) = e^{\boxed{x^3}}$

$f'(x) = e^{\boxed{x^3}} \cdot d\boxed{x^3}$

$f'(x) = 3x^2 e^{x^3}$

2) $y = \ln\left(\boxed{\csc \boxed{3x}}\right)$

$y' = \dfrac{d\,\boxed{\csc \boxed{3x}}}{\boxed{\csc 3x}}$

$y' = \dfrac{-3\csc 3x \cot 3x}{\csc 3x} = -3\cot 3x$

3) $f(x) = \ln\boxed{(x^2+3-e^{5x})}$

$f'(x) = \dfrac{2x - 5e^{5x}}{x^2+3-e^{5x}}$

4) $f(x) = \sec^3(2x) = \boxed{\sec(2x)}^3$

$f'(x) = 3\boxed{\sec(2x)}^2 \cdot d\boxed{\sec(2x)}$

$= 3\sec^2(2x) \cdot \sec(2x)\tan(2x) \cdot 2$

$= 6\sec^3(2x)\tan(2x)$

5) $y = \ln\boxed{(\boxed{x}\sin x)}$

$y' = \dfrac{d\,\boxed{x\sin x}}{x\sin x}$

$y' = \dfrac{x\cos x + \sin x}{x\sin x}$

6) $y = 2^{\cos x}$

$y' = 2^{\boxed{\phantom{x}}} \cdot d\boxed{\phantom{x}} \cdot \ln 2$

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

7) $y = \boxed{x^2}\,e^x$

$y' = x^2e^x + 2xe^x$

8) $y = (x^2+4x+2)^{1/2}$

$y' = \frac{1}{2}(x^2+4x+2)^{-1/2}(2x+4)$

9) $\lim\limits_{h\to 0} \dfrac{\cot(x+h) - \cot x}{h} = -\csc x$

10) $y = e^{\sin x} + x$

$y' = e^{\sin x}(\cos x) + 1$

$y'(\pi) = e^{\sin \pi}(\cos \pi) + 1$

$\boxed{y'(\pi) = 0}$

11) $\sqrt[3]{7.6}$ $f(x) = x^{1/3}$ $a = 8$

point: $(8, 2)$

slope: $f'(x) = \frac{1}{3}x^{-2/3}$, $f'(8) = \frac{1}{12}$

$y - 2 = \frac{1}{12}(x-8)$

$L(x) = 2 + \frac{1}{12}(x-8)$

$L(7.6) = 2 + \frac{1}{12}(7.6-8)$

$f(7.6) \approx 2 + \frac{1}{12}\left(-\frac{2}{5}\right) = \frac{59}{30}$

12) $f(x) = x^2+2x+8 \quad a=3$

point: $(3, 23)$

slope: $f'(x)=2x+2$, $f'(3)=8$

$y-23=8(x-3)$

$L(x) = 23+8(x-3)$

$L(2.9) = 23+8(2.9-3)$

$f(2.9) \approx 22.2$

13) $\lim_{x\to 3} \dfrac{\tan(x-3)}{3e^{x-3}-x} \to \dfrac{\tan 0}{3e^0-3} \to \dfrac{0}{0}$

Using L'Hopital's Rule

$\lim_{x\to 3} \dfrac{\sec^2(x-3)}{3e^{x-3}-1} \to \dfrac{\sec^2(0)}{3-1} = \boxed{\dfrac{1}{2}}$