

AP Calculus AB

WS 42 - Review 2

$$1) y = \frac{e^{-x}}{x+1}$$

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

$$y'(1) = \frac{-2e^{-1} - e^{-1}}{(4)}$$

$$y'(1) = \frac{-3e^{-1}}{4} = -\frac{3}{4e}$$

$$3) f(x) = \cos^3(4x) = [\cos(4x)]^3$$

$$f'(x) = 3[\cos(4x)]^2 \cdot d[\cos(4x)]$$

$$f'(x) = 3\cos^2(4x) \cdot (-4\sin(4x)) \\ = -12\cos^2(4x)\sin(4x)$$

$$5) \begin{array}{ll} \text{point} & \text{slope} \\ (1, 4) & f'(x) = 2x + 1 \\ & f'(1) = 3 \end{array}$$

$$y - 4 = 3(x - 1)$$

$$L(x) = 4 + 3(x - 1)$$

$$L(1.2) = 4 + 3(0.2)$$

$$f(1.2) \approx 4.6$$

$$7) y = \arcsin(5x) \\ \frac{dy}{dx} = \frac{5}{\sqrt{1-25x^2}}$$

$$9) y = (x^3 - \cos x)^5$$

$$y' = 5(x^3 - \cos x)^4 \cdot (3x^2 + \sin x)$$

$$2) f(x) = (2x-1)^4(x+3) \quad x=0$$

$$\begin{array}{ll} \text{point} & \text{slope} \\ (0, 3) & f'(x) = (2x-1)^4 + (x+3) \cdot 4(2x-1)^3 \cdot 2 \\ & f'(0) = (1) + (3)(4)(-1)(2) \\ & = -23 \end{array}$$

$$y - 3 = -23(x - 0)$$

$$4) \lim_{h \rightarrow 0} \frac{e^{(x+h)} - e^x}{h} = e^x$$

$$6) x^2y - 3x = y^3 - 3 \quad (-1, 2)$$

$$x^2 \frac{dy}{dx} + 2xy - 3 = 3y^2 \frac{dy}{dx}$$

$$\text{At } (-1, 2):$$

$$\frac{dy}{dx} - 4 - 3 = 12 \frac{dy}{dx}$$

$$-11 \frac{dy}{dx} = 7$$

$$\frac{dy}{dx} \Big|_{(-1, 2)} = -\frac{7}{11}$$

$$8) y = x \sin x$$

$$y' = x \cos x + \sin x$$

$$10) f(x) = \sqrt{x^2 - 4} \quad g(x) = 3x - 2$$

$$\frac{d}{dx}(f(g(x))) = f'(g(x)) \cdot g'(x)$$

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

$$f'(g(x)) \cdot g'(x) = \frac{1}{2} ((3x-2)^2 - 4)^{-1/2} \cdot 2(3x-2) \quad (3)$$

$$f'(g(3)) \cdot g'(3) = \frac{(3(3)-2) \cdot 3}{\sqrt{(3(3)-2)^2 - 4}} = \frac{21}{\sqrt{45}}$$

$$11) f(x) = \frac{x}{x+2} \quad f'(x) = \frac{1}{2} ?$$

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

$$= \frac{2}{(x+2)^2}$$

$$\frac{2}{(x+2)^2} = \frac{1}{2}$$

$$(x+2)^2 = 4$$

$$x+2 = \pm 2$$

$$\boxed{x = 0, -4}$$

$$(0, 0) \quad (-4, 2)$$

$$12) x^2 - 2xy + 3y^2 = 8$$

$$2x - 2x \frac{dy}{dx} - 2y + 6y \frac{dy}{dx} = 0$$

$$6y \frac{dy}{dx} - 2x \frac{dy}{dx} = 2y - 2x$$

$$\frac{dy}{dx} (6y - 2x) = 2y - 2x$$

$$\frac{dy}{dx} = \frac{y-x}{3y-x}$$

$$13) y = \sqrt{3x^2 + 2x} \quad @ (2, 4)$$

slope

$$\frac{dy}{dx} = \frac{1}{2} (3x^2 + 2x)^{-1/2} (6x + 2)$$

$$= \frac{6x + 2}{2\sqrt{3x^2 + 2x}}$$

$$\left. \frac{dy}{dx} \right|_{(2,4)} = \frac{14}{2\sqrt{16}} = \frac{14}{8} = \frac{7}{4}$$

$$N: y - 4 = -\frac{4}{7}(x - 2)$$