SEMESTER REVIEW (Part 2)

13(h)

$$f(x) = \begin{cases} x^2 + 3x - 4 & x \le 2 \\ x + 4 & x > 2 \end{cases} \qquad a = 2$$

1) $f(a)$ is defined.
2) $\lim\limits_{x \to a}$ exists
3) $f(a) = \lim\limits_{x \to a} f(x)$
4) $f'(a)^- = f'(a)^+$

1) $f(2) = 2^2 + 3(2) - 4 = 6$

2) $\lim\limits_{x \to 2^-} x^2 + 3x - 4 = 6$

$\lim\limits_{x \to 2^+} x + 4 = 6$

$\lim\limits_{x \to 2} f(x) = 6$

3) $f(2) = \lim\limits_{x \to 2} f(x)$

f is continuous

4) $f'(2)^- = 2x + 3 = 7$

$f'(2)^+ = 1$

$f'(2)^- \neq f'(2)^+$

not differentiable.

Find the eq. of the tangent line to the graph of $f(x) = \frac{2}{x} - 3x$ at $x = -2$

$x = -2 \quad y = f(-2) = \frac{2}{-2} - 3(-2) = 5$

$(-2, 5)$

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

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

$= \frac{-2}{4} - 3$

$\boxed{m = -\frac{7}{2}}$

$y - y_1 = m(x - x_1)$

$y - 5 = -\frac{7}{2}(x + 2)$

$y - 5 = -\frac{7}{2}x - 7$

$\boxed{y = -\frac{7}{2}x - 2}$

Find $\frac{dy}{dx}$.

$$\underbrace{y^2 e^{3x}} + 2\sec x = 4y - 7^{x^2}$$

$$\underbrace{y^2 \cdot e^{3x} \cdot 3} + e^{3x} \cdot 2y\frac{dy}{dx} + 2\sec x\tan x = 4\frac{dy}{dx} - \ln 7 \cdot 7^{x^2} \cdot 2x$$

$$3y^2 e^{3x} + 2ye^{3x}\frac{dy}{dx} + 2\sec x\tan x = 4\frac{dy}{dx} - 2x \cdot \ln 7 \cdot 7^{x^2}$$

$$3y^2 e^{3x} + 2\sec x\tan x + 2x\ln 7 \cdot 7^{x^2} = 4\frac{dy}{dx} - 2ye^{3x}\frac{dy}{dx}$$

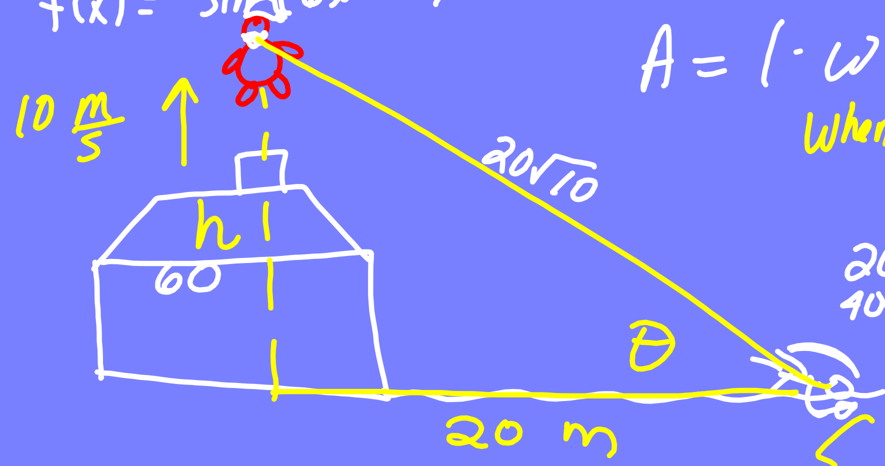
$$\frac{3y^2 e^{3x} + 2\sec x\tan x + 2x\ln 7 \cdot 7^{x^2}}{4 - 2ye^{3x}} = \frac{dy}{dx}\cancel{(4 - 2ye^{3x})}$$

$f(x) = \sin^3(6x^2 - 5x) = \left(\sin(6x^2 - 5x)\right)^3$

$f(x) = \sin(6x^2 - 5x)^3$

$A = l \cdot w$

When Santa is 60m high



$20^2 + 60^2 = h^2$

$400 + 3600 = h^2$

$\sqrt{4000} = \sqrt{h^2}$

$20\sqrt{10} = h$

$\frac{20}{h} = 20h^{-1}$

$-\frac{20}{h^2}\frac{dh}{dt}$

$\frac{1}{20}h$

$$\frac{d}{dt}\left[\tan\theta = \frac{h}{20}\right]$$

$$\sec^2\theta \frac{d\theta}{dt} = \frac{1}{20}\frac{dh}{dt}$$

$$\left(\frac{\cancel{20}\sqrt{10}}{\cancel{20}}\right)^2 \frac{d\theta}{dt} = \frac{1}{20}$$

$$10\frac{d\theta}{dt} = \frac{1}{20}(10)$$

$$10\frac{d\theta}{dt} = \frac{1}{2}$$

$$\frac{d\theta}{dt} = \boxed{\frac{1}{20}\ \frac{\text{rad}}{\text{sec}}}$$