HW10

2.11 #3 $\frac{d}{dx}(x^5y^2) = \frac{d}{dx}(2x+4y)$

$\Downarrow$

$5x^4y^2 + x^5 \cdot 2y \cdot \frac{dy}{dx} = 2 + 4 \cdot \frac{dy}{dx}$

$\Downarrow$

$(2x^5y - 4)\frac{dy}{dx} = 2 - 5x^4y^2$

$\Downarrow$

$$\boxed{\frac{dy}{dx} = \frac{2-5x^4y^2}{2x^5y-4}}$$

#4 Find slope first:

$\frac{d}{dx}\left(\frac{x}{y} + \frac{y^5}{x^5}\right) = 0$

$\Downarrow$

$$\frac{1 \cdot y - x \cdot \frac{dy}{dx}}{y^2} + \frac{5y^4 \cdot \frac{dy}{dx} \cdot x^5 - y^5 \cdot 5x^4}{x^{10}} = 0$$

$$\Downarrow$$

$$\frac{y - x \cdot \frac{dy}{dx}}{y^2} + \frac{5x^5y^4 \cdot \frac{dy}{dx} - 5x^4y^5}{x^{10}} = 0$$

Plug in $x = -1$, $y = -1$

$$\frac{(-1) + \frac{dy}{dx}}{1} + \frac{(-5) \cdot 1 \cdot \frac{dy}{dx} - 5 \cdot (-1)}{1} = 0$$

$$\Downarrow$$

$$-1 + \frac{dy}{dx} - 5 \cdot \frac{dy}{dx} + 5 = 0$$

$$\Downarrow$$

$$4\frac{dy}{dx} = 4$$

$$\Downarrow$$

$$\frac{dy}{dx} = 1$$

$$y + 1 = 1 \cdot (x + 1)$$

$$\Downarrow$$

$$y \cancel{+1} = x \cancel{+1}$$

$$\Downarrow$$

$$y = x$$

#8 (1) $\frac{d}{dx}(x) = \frac{d(\sin y + \cos y)}{dx}$

$\Downarrow$

$1 = \cos y \cdot \frac{dy}{dx} - \sin y \cdot \frac{dy}{dx}$

$\Downarrow$

$(\cos y - \sin y) \cdot \frac{dy}{dx} = 1$

$\Downarrow$

$$\boxed{\frac{dy}{dx} = \frac{1}{\cos y - \sin y}}$$

(2) $\frac{d}{dy}(x) = \frac{d(\sin y + \cos y)}{dy}$

$\Downarrow$

$$\boxed{\frac{dx}{dy} = \cos y - \sin y}$$

2.12 #2 $\frac{dy}{dx} = \frac{d}{dx}(\ln(5+8^x))$

$= \frac{1}{5+8^x} \cdot (8^x)'$

According to Table of Derivatives,

$$(8^x)' = 8^x \ln 8.$$

so $$\frac{dy}{dx} = \frac{1}{5+8^x} \cdot 8^x \ln 8.$$

\#3 $$f'(x) = e^{4x^2-6x+9} \cdot (4x^2-6x+9)'$$

$$= e^{4x^2-6x+9} \cdot (8x-6).$$

\#6 $$f' = 1 \cdot e^{-4x} + x \cdot e^{-4x} \cdot (-4)$$

$$= (-4x+1) \cdot e^{-4x}$$

$f' = 0 \Rightarrow x = \frac{1}{4}$

When $x > \frac{1}{4}$, $f' < 0$, f is decreasing. (D)

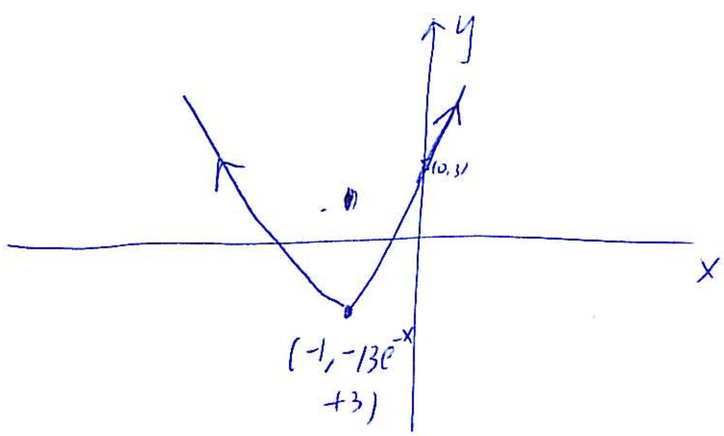
When $x < \frac{1}{4}$, $f' > 0$, f is increasing. (I)

#9 $f'(x) = 13e^x + 13x \cdot e^x$

$= 13(x+1)e^x$

When $x \geq -1$, $f'(x) \geq 0$, $f(x)$ is increasing;

$x < -1$, $f'(x) < 0$, $f(x)$ is decreasing.



so there's no absolue max;

absolue min @ $x = -1$.