497. Slope of the given line:

$$y = \underset{\substack{\uparrow \\ 10.}}{10x} + 3$$

Parallel lines have same slopes.

What is y's slope? $\frac{dy}{dx}$.

$$y = 3x^4 - 2x + 1$$

$$\underbrace{\frac{dy}{dx} = 12x^3 - 2}_{\text{Slope of } y} = \underbrace{10}_{\text{slope of line}}$$

Slope of y // slope of line

$$12x^3 - 2 = \cancel{10}$$
$$-10 \qquad \cancel{-10}$$
$$12x^3 - 12 = 0$$
$$12(x^3 - 1) = 0$$
$$12(x-1)(x^2 + 1x + 1) = 0$$
$$\Downarrow$$
$$x - \cancel{1} = 0$$
$$\cancel{+1} \quad +1$$

$\underline{x = 1} \Rightarrow y = 3(1)^4 - 2(1) + 1$
$= 3 - 2 + 1$
$= 2$

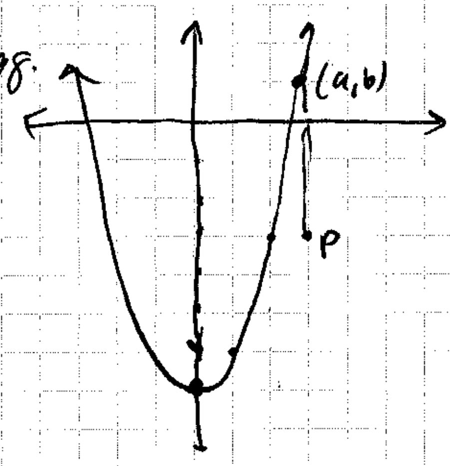
Point: $(1, 2)$

slope: 10

$$\boxed{y - 2 = 10(x-1)}$$

$$(a^3 - b^3) = (a-b)(a^2 + ab + b^2)$$

498.



Let (a,b) be some point on $y=x^2-7$ ~~th~~ whose tangent line passes thru P.

Since (a,b) is on the curve,

$$y=x^2-7$$
$$b=a^2-7. \quad (*)$$

← COME BACK HERE LATER.

The slope at (a,b) is $f'(a)$.

Since $f'(x)=2x$, $f'(a)=2a$.

~~So Slope~~

So Slope is $2a$ and point is (a,b).

Line equation:

$$y-y_1=m(x-x_1)$$
$$y-b=2a(x-a)$$

Since this line must travel thru $P(3,-2)$ we can plug that in:

$$y-b=2a(x-a)$$
$$-2-b=2a(3-a)$$

<u>But</u> we know b in terms of a.

(See equation $(*)$)

So subbing in $b=a^2-7$...

$$-2-b=2a(3-a)$$
$$-2-(a^2-7)=2a(3-a)$$

Solve for a: $-2-a^2+7=6a-2a^2$

$$a^2-6a+5=0$$
$$(a-1)(a-5)=0$$
$$a=1, \quad a=5$$
$$\Downarrow \qquad \Downarrow$$

so $b=1^2-7=-6$ $\qquad$ $b=5^2-1=24$

$(1,-6)$ $\qquad$ $(5,24)$

TAN Line at $(1,-6)$

$f'(1)=2$

$$\boxed{y+6=2(x-1)}$$

TAN LINE at $(5,24)$

$f'(5)=2(5)=10$

$$\boxed{y-24=10(x-5)}$$

505-

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
-1	0	-1	2	1
0	-1	-3	-2	4

b.) $\underbrace{[f(x)]^3}_{f}\underbrace{[g(x)]^3}_{g}$ $\quad f' = 3[f(x)]^2 \cdot f'(x)$

take derivative of this: $\quad g' = 3[g(x)]^2 \cdot g'(x)$

$f'g + fg'$

$3[f(x)]^2 \cdot f'(x) \cdot [g(x)]^3 + [f(x)]^3 \cdot 3[g(x)]^2 \cdot g'(x)$

plug in $(x=0)$

$3[f(0)]^2 \cdot f'(0) \cdot [g(0)]^3 + [f(0)]^3 \cdot 3[g(0)]^2 \cdot g'(0)$

$3(-1)^2 \cdot (-2)(-3)^3 + (-1)^3 \cdot 3(-3)^2 \cdot 4$

$3 \cdot 1 \cdot -2 \cdot -27 + (-1) \cdot 3 \cdot 9 \cdot 4$

$3 \cdot -2 \cdot -27 + -3 \cdot 9 \cdot 4$

$-6 \cdot -27 + -27 \cdot 4$

$162 + -108$

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c. $\frac{d}{dx} \frac{f(x)}{g(x)+2} \begin{matrix} \leftarrow f \\ \leftarrow g \end{matrix}$ $\quad f' = f'(x)$, $\quad g' = g'(x)$

@ $x=0$

$\frac{f'g - fg'}{g^2} \Rightarrow \frac{f'(x)[g(x)+2] - f(x) \cdot g'(x)}{(g(x)+2)^2}$

@ $x=0$ $\quad \frac{f'(0)[g(0)+2] - f(0) \cdot g'(0)}{(g(0)+2)^2}$

$\frac{(-2)[-3+2] - (-1)(4)}{(-3+2)^2} \Rightarrow \frac{(-2)(-1) - -4}{(-1)^2} = \frac{2+4}{1}$

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