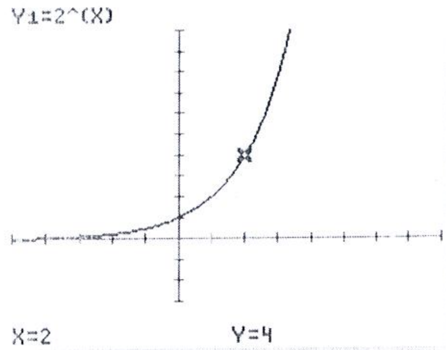
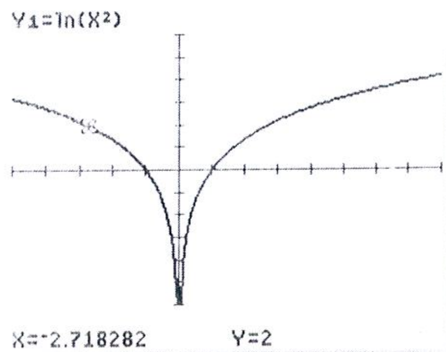
Linearization

- Sketch tangent line of known point
- Using a tangent line of a known point, approximate the given value.
- Then tell whether this is an over- or under-approximation. Justify your answer.

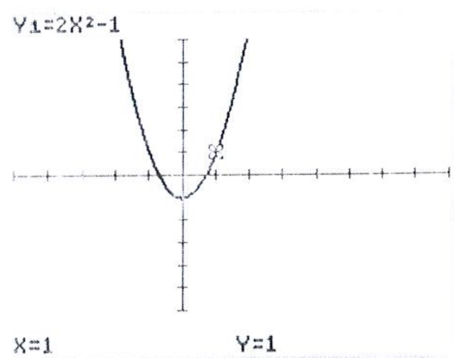
1. Approximate $2^{(1.8)}$



2. Approximate $\ln((-3)^2)$



3. Approximate $2(1.3)^2 - 1$



4. Approximate $(4.1)^3 + 2$

Linearization

- Sketch tangent line of known point
- Using a tangent line of a known point, approximate the given value.
- Then tell whether this is an over or under approximation. Justify your answer.

1. Approximate $2^{(1.8)}$

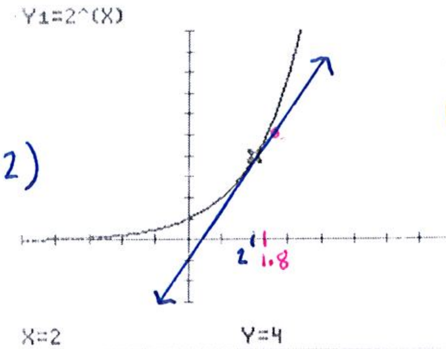
<u>pt</u>: $\boxed{(2,4)}$

<u>slope</u>: $y' = 2^x \ln 2 \cdot 1$

$y'(2) = 2^2 \ln 2$

$= \boxed{4\ln 2}$

<u>tangent</u>: $y - 4 = 4\ln 2(x-2)$



<u>under</u> appx since $f''>0 \rightarrow$ concave up

linearization: $y = 4 + 4\ln 2(1.8-2)$

2. Approximate $\ln((-3)^2)$

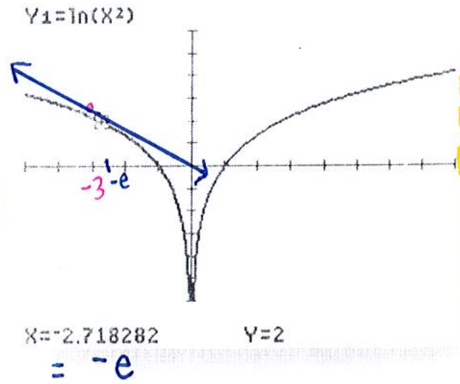
<u>pt</u>: $\boxed{(-e,2)}$

<u>slope</u>: $y' = \frac{1}{x^2} \cdot 2x$

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

$= \boxed{-2/e}$

<u>tangent</u>: $y - 2 = -\frac{2}{e}(x+e)$



<u>over</u> appx since $f''<0 \rightarrow$ concave down

linearization: $y = 2 - \frac{2}{e}(-3+e)$

3. Approximate $2(1.3)^2 - 1$

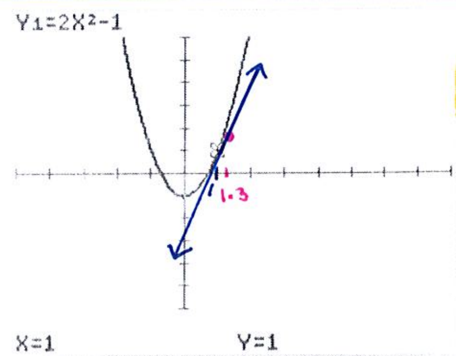
<u>pt</u>: $\boxed{(1,1)}$

<u>slope</u>: $y' = 4x$

$y'(1) = 4(1)$

$= \boxed{4}$

<u>tangent</u>: $y - 1 = 4(x-1)$



<u>under</u> appx since $f''>0 \rightarrow$ concave up

linearization: $y = 1 + 4(1.3-1)$

4. Approximate $(4.1)^3 + 2$ $\rightarrow$ function: $y = x^3 + 2$

<u>pt</u>: $\boxed{(4,66)}$

<u>slope</u>: $y' = 3x^2$

$y'(4) = 3(4)^2$

$= \boxed{48}$

<u>tangent</u>: $y - 66 = 48(x-4)$

linearization: $y = 66 + 48(4.1-4)$

*since we don't have graph, check f" by hand to find whether concave up/down

$y'' = 6x$

$y''(4) = 6(4) > 0$

concave up $\rightarrow$ <u>under</u> appx