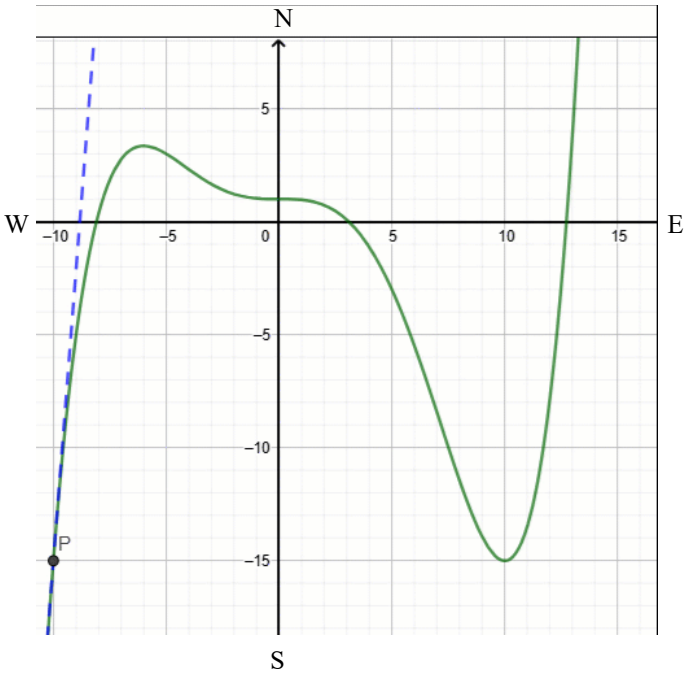
Tangent Lines and Thomas the Tank Engine (Section 2.1)

Copy and paste x^5/3125-x^4/625-4x^3/125+1 in the box at the page **HERE**.
Then use the slider. Set $x_{start} = -10$ and $x_{end} = 15$. Resize the page.

Informally: If a drone in the sky filmed Thomas the Tank Engine traveling on the curve at night, at point *P* Thomas' engine lights shine in the path of the **tangent line** to the curve at *P*. (A more formal definition will be given later.)

1. Complete the blanks.



Tangere is Latin for _____.

At the **relative maximum** the output is the ____*est* among those in the point's local neighborhood *(on my left and on my right)."*

At the **relative minimum** the output is the ____*est* among those in the point's local neighborhood *(on my left and on my right)."*

At the **point of inflection** the _____ changes,

At a **stationary point** the tangent line is _____.
{horizontal, vertical}

2. Mark each stationary point.
Assume Thomas only boards/deboards passengers when his headlights face due east or due west.
Sketch a train station next to each stationary point.

3. Complete with the words *negative, zero,* or *positive*.
a. When the slope of the tangent line at the point *P* to the graph is _____ the graph is *increasing.*
b. When the slope of the tangent line at the point *P* to the graph is _____ the graph is de*creasing.*
c. The point *P* is a *stationary point* when the slope of the tangent line at the point *P* to the graph is _____

4. Consider these questions for a *smooth* graph, i.e. one that Thomas can ride on with no sharp corners.
True or False. Explain. If False, give a counterexample.

a. If a function has a **stationary point** at point *P*,
then *P* is either a local max, local min, or point of inflection.

b. If a function has a **point of inflection** (concavity change) on a smooth graph at point *P*,
that point must be a stationary point.