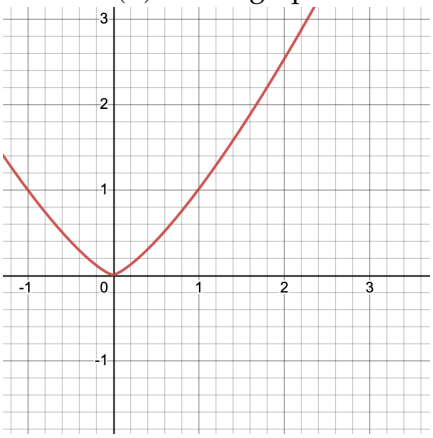
SECTION 4.2: LINEAR APPROXIMATIONS AND DIFFERENTIALS

1. The linear approximation, $L(x)$, of $f(x)$ at $x = a$ is:

2. Let $f(x) = x^{4/3}$.

   (a) Find the linear approximation $L(x)$ of $f(x)$ at $a = 1$.

   (b) Sketch $L(x)$ on the graph below.



   (c) Use $L(x)$ to estimate $(1.1)^{4/3}$ and mark this y-value on the graph above.

   (d) Use your calculator to find $(1.1)^{4/3}$ exactly, mark this y-value on the graph above, determine the error between the exact value and the estimate, and mark the error on the graph above.

3. Estimate $\frac{1}{2.01}$ using an appropriate linear approximation (pick an $f(x)$ and an a). Use your calculator to determine the exact value and the error.

4. The differential of $y = f(x)$ is

5. Given $f(x) = x\sin(\frac{\pi}{2}x)$.

   (a) Find the differential of $f(x)$ and evaluate the differential when $x = 2$ and $dx = 0.1$.

   (b) Use a calculator to find $f(2.1) - f(2)$.

   (c) Explain what the calculations in parts (a) and (b) represent and why they are close but not the same.

6. The side of a cube is measured to be 2 meters with a possible error in measurement of 0.1 meter. Use differentials to estimate the maximum possible error when computing the volume of the cube. Determine the relative (or percent) error.