3-10

Review – PAGE A

Let $f(x) = \sqrt{x}$.

1. Find the equation of the line tangent to the curve of $f(x)$ at $x = 4$.

2. On the same set of axes, draw a large, reasonably accurate graph of $f(x)$ and its tangent line. Label them.

3. Correct to at least 5 decimal places, find the y-value of the function $f(x)$ when $x = 4.1$ and find the y-value of the tangent line when $x = 4.1$. Graph and label these points on the axes above.

4. Correct to at least 3 decimal places, determine the change in y when x changes from 4 to 4.1 for the function $f(x)$ and for the tangent line. Sketch these quantities.

Practice Problems (round 1)

1. (a) Without the use of a calculator, find the linear approximation of $f(x) = \sin x$ at $x = 0$ and use it to approximate $\sin(0.1)$.

   (b) Use a calculator to find $\sin(0.1)$ exactly and compare to your approximation.

2. (a) Find the differential for $y = x^2 - 4x$.

   (b) Use the differential to estimate Δy when $x = 3$ and $\Delta x = dx = 0.5$. (Don't use a calculator!)

   (c) Now use a calculator to find Δy precisely and compare.

Let $f(x) = \sqrt{x}$.

1. Find the **linear approximation** of $f(x)$ at $x = 4$. [Replace y with $L(x)$.]

2. On the same set of axes, draw a large, reasonably accurate graph of $f(x)$ and linear approximation. Label them.

3. **Use the linear approximation of $f(x)$ at $x = 4$ to estimate $f(4.1)$. How good is this estimation?**

4. **Use the differential to estimate Δy when $x = 4$ and $\Delta x = dx = 0.1$.**

Practice Problems (round 2)

1. Use a linear approximation to estimate $\sqrt[3]{124}$.

2. The radius of a circular disk is given at 24 cm with a maximum error in measurement of at most 0.2 cm. Use differentials to estimate the maximum error in the calculated area of the disc. Does this error seem large?