A. Lesson Objectives

a. Review the basic concept of the "Power Rule"
b. Explore the Power Rule for values of n, where n = a/b (root functions).
c. Work with lines tangent and normal to a function.

B. Exploring the Power Rule where n = a/b

Work through examples in ppt lesson 7

C. Example Set #1

a. Determine the equation of the line that is tangent to $y = 3x^2 – x^3$ at the point (1,2).
b. Draw a diagram illustrating the function and this tangent line.

c. Determine the equation of the line that is normal to $y = 3x^2 – x^3$ at the point (1,2).
d. Draw a diagram illustrating the function and this perpendicular line.
e. Determine the other point(s) at which this normal line interects $y = 3x^2 – x^3$.

D. Example Set #2

a. Determine the point on the curve of $y = x^2 + 3x$ at which the line $y = 7x – 4$ is tangent to the curve.
b. Find the equations of the tangents to the parabola $y = x(x + 2)$ that pass through the point (1,-6). Sketch the curve and the tangents.
c. Find all the points of the curve $y = 2 – 1/x$ where the tangent is perpendicular to the line $y = 1 – 4x$.
d. Given the parabola $f(x) = x^2$. Two tangent lines are drawn, one at $x = 2$ and one at $x = -3$. Determine the intersection point of the two tangent lines.
e. Find the equation of the tangent to the curve $y = x^2 – 2x$ that is parallel to the line $y = 4x + 2$.

E. Example Set #3

a. At what points does the curve $y = 2x^3 + 3x^2 – 36x + 40$ have horizontal tangents? Explain the significance of these points.
b. Show that the curve $y = 2x^3 + 3x – 4$ has no tangents with a slope of 2.

F. Example Set 4

6. Find the equation of the tangent and the normal to the curve $x \mapsto x + \frac{1}{x}, x \neq 0$ at the point $(1, 2)$.

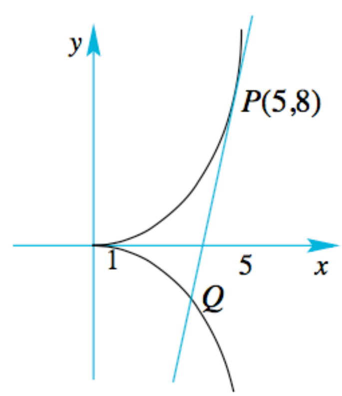
Find the coordinates of the points where the tangent and the normal cross the x- and y-axes, and hence determine the area enclosed by the x–axis, the y–axis, the tangent and the normal.

12. The straight line $y = -x + 4$ cuts the parabola with equation $y = 16 - x^2$ at the points A and B.

(a) Find the coordinates of A and B.
(b) Find the equation of the tangents at A and B, and hence determine where the two tangents meet.

14. The figure shows the curve whose equation is given by

$$y^2 = (x - 1)^3 .$$



The tangent drawn at the point $P(5,8)$ meets the curve again at the point Q.

(a) Find the equation of the tangent at the point P.

(b) Find the coordinates of Q.

15. The line L and the curve C are defined as follows,

$$L: y = 4x - 2 \text{ and } C: y = mx^3 + nx^2 - 1$$

The line L is a tangent to the curve C at $x = 1$.

(a) Using the fact that L and C meet at $x = 1$, show that $m + n = 3$.

(b) Given that L is a tangent to C at $x = 1$, show that $3m + 2n = 4$.

(c) Hence, solve for m and n.