Exam #3

1. Find the area under the curve $y = x\sqrt{4 - x^2}$ between $x = 0$ and $x = 2$.

2. Find the equation of the tangent line at the point $(20,\ 1.5)$ to the curve $y = \int_1^{\sqrt{x}} \frac{1}{t}\, dt$.

3. Find the particular solution $r(t)$ to the following differential equation:

$$\frac{dx}{dt} = 2t\, x^2 \quad , \qquad r(0) = -1$$

4. Evaluate the following indefinite integral:

$$\int \sec^2(y^3) \cdot 3y^2\, dy$$

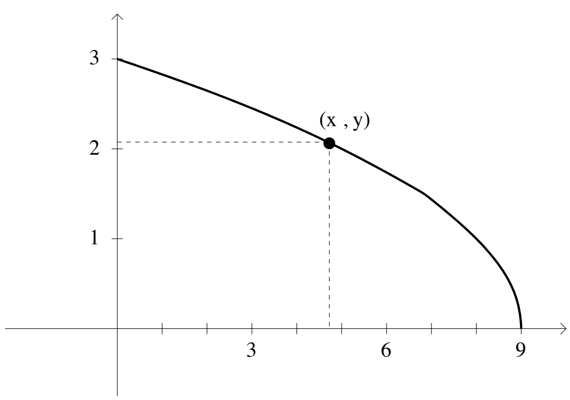
5. Suppose the acceleration (in feet per second per second) is given by the equation $a(t) = 6t - 2$. Further suppose that the velocity satisfies $v(1) = 0$ and the position satisfies $s(0) = 1$.

   (a) Find the equations for $v(t)$ and for $s(t)$.

   (b) Compute the average velocity over the time interval $[0, 1]$.

   (c) Find the point in time in the open interval $(0, 1)$ where the instantaneous velocity is equal to the average velocity over the time interval $[0, 1]$.

6. Find the point (x, y) on the curve $y = \sqrt{9 - x}$ in the first quadrant such that the rectangle formed has maximal area.



7. (a) Estimate the definite integral $\int_0^1 8x\, dx$ by using 4 rectangles and by using the right-hand endpoints of the 4 subintervals to determine the heights of the rectangles.

   (b) Evaluate the definite integral $\int_0^1 8x\, dx$.