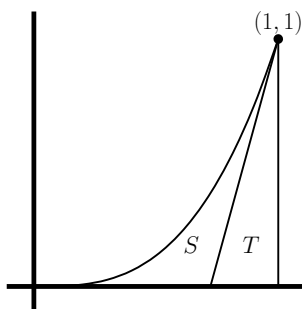1. Find the area bounded by the graphs of $y = -5\sin(x)$, $y = -\dfrac{1}{2}x^2 + 5$, $x = 0$, and $x = \pi$.

2. Find the area of the bounded region between the curves $y = 4\sqrt{x}$ and $y = (x-1)^2 - 1$.

3. Find the area of the region bounded by $x = \sin(y)$, $x = 1$, $y = 0$, and $y = \pi$.

4. (From the 2004 AP Calculus AB exam) Consider the graph below.

Let ℓ be the line tangent to the graph of $y = x^n$ at the point $(1, 1)$, where $n > 1$, as shown above.

(a) Let A be the region under the graph of $y = x^n$ and above the x-axis from $x = 0$ to $x = 1$. Find the area of A in terms of n.

(b) Let T be the triangular region bounded by ℓ, the x-axis, and the line $x = 1$. Find the area of T in terms of n.

(c) Let S be the region bounded by the graph of $y = x^n$, the line ℓ, and the x-axis. Express the area of S in terms of n.

(d) Find the value of n that maximizes the area of S.

5. (From the 2003 AP Calculus AB exam) Consider the graph below.
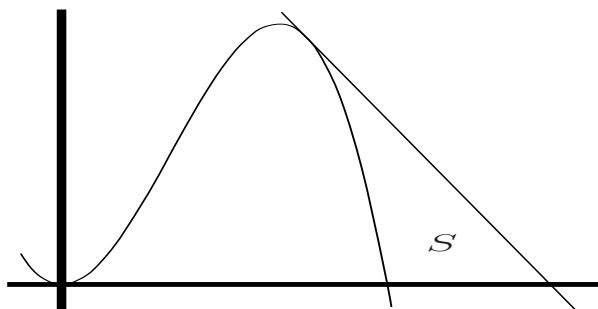
Let f be the function given by $f(x) = 4x^2 - x^3$, and let ℓ be the line $y = 18 - 3x$, where ℓ is tangent to the graph of f in the first quadrant. Let S be the region bounded by the graph of f, the line ℓ, and the x-axis, as shown above.

(a) Find the x-coordinate of the point where ℓ is tangent to the graph of f.

(b) Find the area of S.