MATH 16
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SAMPLE TEST # 3

Solve the exercises. **Show your work.**

Ex. 1. Solve the initial value problem: $y' = e^{x-y}, \quad y(0) = 1.$

Ex. 2. Find the arc length of the curve: $y = x^2 - \dfrac{\ln x}{8}, \quad 1 \le x \le 4.$

Ex. 3. Find the area of the surface obtained by rotating the curve $y = x^2$ from $(1, 1)$ to $(2, 4)$ about the y-axis.

Ex. 4. Find the centroid of the region bounded by the curves $y = \cos x$, $y = 0$, $x = 0$, and $x = \pi/2$.

Ex. 5. Eliminate the parameter from the equations $x = \sin t$ and $y = \sin^2 t$. Sketch its graph.

Ex. 6. Find $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$ for $x = t^2$ and $y = t^3 - 3t$.

Ex. 7. Find the surface area generated by rotating the curve $x = e^t - t$, $y = 4e^{t/2}$, $0 \le t \le 1$, about the x-axis.

Ex. 8. Change to polar coordinates. **Simplify your answer.**

$x^2 + y^2 = 2x + 4.$

Ex. 9. Change to Cartesian (rectangular) coordinates. **Simplify your answer.**

$r = 2\cos\theta - 3\sin\theta.$

Ex. 10. Find the slope of the tangent line to the curve: $r = 1 + \sin\theta \quad$ for $\quad \theta = \pi/3.$

Ex. 11. Find the area of the region that lies inside the curve $r = 3\sin\theta$ and outside the curve $r = 1 + \sin\theta$.

Ex. 12. Find the equation of the parabola with focus $(1, -1)$ and directrix $y = 5$.