Calculus 1 Sample final Exam

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1. Compute the tangent line for $y = \sqrt{2x-1}$ at $x = 5$.

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2. Compute

$$\int_0^{\frac{\pi}{2}} \cos^2 x dx.$$

3. Compute $\frac{dy}{dx}$ for

$$x^2 + xy - y^2 = 1.$$

4. Classify (removable, jump, infinite) the discontinuities of the piecewise defined function

$$f(x) = \begin{cases} \frac{1}{x} & \text{for } x < 0 \\ \sqrt{x^2+1} & \text{for } 0 \leq x \leq 1 \\ x & \text{for } 1 < x < 3 \\ x^2 - 6 & \text{for } x \geq 3 \end{cases} \tag{1}$$

5. Find

$$\frac{d^2}{dx^2}\int_1^x \frac{1}{t^2+1}dt.$$

6. An object is dropped and hits the ground 6 seconds later. From what height was it dropped? (Take $g = 32ft/s^2$).

7. Find

$$\int_0^2 x\sqrt{4-x^2}dx.$$

8. Let $f(x) = x^2(1-x)$. Find the increasing,decreasing, concave-up and concave down intervals and draw the graph.

9. Compute the area of the region bounded by $x = y^2$ and $x - y = 2$.

10. Use disc method to compute the volume of the sphere of radius 1.