

Name _____

- You have 20 minutes
- No calculators
- Show sufficient work

1. (3 points) Find the average value of the function $f(x) = \frac{30x^2}{x^3 + 12}$ on the interval $[1, 3]$. Simplify your answer.

2. Let \mathbf{R} be the finite region bounded by the graphs of $x = 0$, $y = 3e^{2x}$ and $y = 24e^{-x}$. Set up, but do not evaluate, definite integrals which represent the volumes of the following solids.
- (a) (3 points) The volume of the solid with base \mathbf{R} for which the cross-sections perpendicular to the x -axis are semi-circles.

(b) The volume of the solid formed when \mathbf{R} is revolved around the line $x = -2$. Determine this volume in the following two ways.

i. (2 points) Integrate with respect to x .

ii. (2 points) Integrate with respect to y . (Use different integrands in parts *i* and *ii*.)