

Name: _____

HW78: Unit 11 Test Review

Position, Velocity, Acceleration:

1. The position of a particle moving along the x-axis is $x(t) = \sin(2t) - \cos(3t)$ for $t \geq 0$.
When $t = \pi$, what is the acceleration of the particle?
2. An object moves along the x-axis so that at any time $t > 0$ its position is given by $x(t) = t^4 + t^3 - 30t^2 + 88t$. At the instant when the acceleration becomes 0, what is the velocity?
3. A particle moves in a straight line with velocity $v(t) = t^2 - 2t$. What is the total distance the particle moves between times $t = 1$ and $t = 3$?
4. The acceleration at time $t > 0$ of a particle moving along the x-axis is $a(t) = 3t + 2$ ft/sec².
If at 1 second the velocity is 4 ft/sec and the position is $x = 6$ ft, then what is the position at 2 seconds?
5. What is the displacement attained on the interval $0 \leq t \leq 2$ by the particle whose velocity is given by $v(t) = t^3 - 3t^2 + 12t + 4$?

Area: Find the area bounded by the curves.

6. $y = \sin x$, $y = e^x$, $x = 0$, $x = \frac{\pi}{2}$

7. $y = x$ and $y^3 = x$

8. $y = x^3 - x$ and $y = 3x$

9. $y = |x|$ and $y = x^2 - 2$

Volume: Find the volume of the region bounded by the curves and rotated around the designated axis.

10. $y = x^2$, $y = 4$ about the line $y = 4$

11. $y = x^2$ and $y^2 = x$ about the x-axis

12. $y^2 = x$ and $x = 2y$ about the y-axis

13. $x^2 = y$, $x = 0$, $y = 1$ about the x-axis

14. $x = 4y^2 - y^3$, $x = 0$ about the y-axis

15. $x + y = 3$, $x = 4 - (y - 1)^2$ about the y-axis

Setup, but DO NOT SOLVE, a simplified area integral to find the volume of the region bounded by the curves and rotated around the designated axis.

16. $y = x^2$, $x = y^2$, about $x = 2$

17. $y = x$, $x = y^2$, about $y = -2$

18. $x = 4y - y^2$, $x = 8y - 2y^2$ about $x = -2$

19. $y = (x - 1)^2$, $y = 2x - 2$ about $y = 7$

Answers:

1. -9

2. 12

3. 2

4. 13 ft

5. 28

6. $e^{\frac{\pi}{2}} - 2$

7. $\frac{1}{2}$

8. 8

9. 20/3

10. $512\pi/15$

11. $3\pi/10$

12. $64\pi/15$

13. $4\pi/5$

14. $16384\pi/105$

15. $108\pi/5$

16. $\int_0^1 \pi \left[(2-y^2)^2 - (2-\sqrt{y})^2 \right] dy$

17. $\int_0^1 \pi \left[(\sqrt{x}+2)^2 - (x+2)^2 \right] dx$

18. $\int_0^4 \pi \left[(8y-2y^2+2)^2 - (4y-y^2+2)^2 \right] dy$

19. $\int_1^3 \pi \left[(-x^2+2x+6)^2 - (-2x+9)^2 \right] dx$