Exam 2 Review:

1. $\sqrt{2} + \ln |\sqrt{2} + 1|$

2. $12\sqrt{3}$

3. (a) $\pi \left[ (\sqrt{1+e^4}e^2 + \ln \sqrt{1+e^4} + e^2) - (\sqrt{1+e^2}e + \ln \sqrt{1+e^2} + e) \right]$

   (b) $\frac{128\pi}{5}$

4. (a) $\frac{\pi}{6} (3\sqrt{37} -17\sqrt{17})$

   (b) setup: $4\pi \int_0^1 (2t - 1)\sqrt{1 + e^4t^4} \, dt$

5. $y(1) \approx 0.7974472656$

6. (a) $\cos x + x \sin x = y^2 + \frac{1}{3} e^{3y} + \frac{2}{3}$

   (b) $y = \tan(t-1)$

   (c) $y(x) = \frac{1}{1-x}$

   the differential equation is NOT separable:
   try problem 43 or 48 in 9.3

7. $48\%$

8. $x = (\frac{5-y}{2})^2 - 2$

9. $y = (x+1)^2, \quad x > -1$

10. $y = x^2$, parabola (standard)

11. $r^2 = \sec 2\theta$
12.

13. (a) \[
\frac{2\pi}{2}
\]

(b) 4

14. \(\frac{\pi}{8}\)
15. A direction field for the differential equation \( y' = y^2 - x \) is shown. Sketch the graphs of the solutions that satisfy the given initial conditions.

(a) \( y(0) = 0 \)  
(b) \( y(0) = 2 \)  
(c) \( y(1) = 1 \)

16. Match the differential equation with its direction field.

A. \( y' = y - 1 \)  
B. \( y' = y^2 - x^2 \)  
C. \( y' = y - x \)  
D. \( y' = y^3 - x^3 \)