MATH 140/140A/140E
Fall 2003
Final Exam
Test Form A
Decemebr 18, 2003

ANSWERS:

1. C
2. E
3. E
4. A
5. B
6. C
7. D
8. A
9. D
10. E
11. A
12. E
13. D
14. B
15. A
16. B
17. E
18. B
19. Let $u = 1 + \sqrt{x}$; then $du = \frac{1}{2\sqrt{x}}dx$, so $2\sqrt{x}\,du = dx$.
When $x = 1$, $u = 1 + \sqrt{1} = 2$ (lower limit of integration)
When $x = 4$, $u = 1 + \sqrt{4} = 3$ (upper limit of integration)
Therefore:

$$\int_1^4 \frac{1}{\sqrt{x}(1+\sqrt{x})^2}\,dx = \int_2^3 \frac{2}{u^2}\,du = \left.\frac{-2}{u}\right|_2^3 = \frac{-2}{3} + \frac{2}{2} = \frac{1}{3}$$

20.
a) The intersections are (0,1) and (0,-1)
c) Both function are in terms of y, so you should (it is much easier this way) integrate with respect to y.

$$Area = \int_{-1}^{1}[(1-y^2)-(2y^2-2)]dy \qquad OR \qquad = 2\int_0^1[(1-y^2)-(2y^2-2)]dy$$

$$= \int_{-1}^{1}(-3y^2+3)dy = (-y^3+3y)|_{-1}^{1} = (-1+3)-(1-3) = 4$$

21.
a) $\int_0^{\pi} \pi[(\sin x + 1)^2 - 1^2]dx$

b) $\int_0^{\pi} 2\pi x[\sin x + 1 - 1]dx$

(You only need to set up the integrals. Simplifying the expressions is optional.)