

**MATH 145**  
**WINTER 2008**  
**SAMPLE EXAM II — ANSWERS**

1. (a) HINT: Substitution: let  $u = 1 - x$ .  
ANSWER:  $\frac{2}{3}$
- (b) HINT: Substitution: let  $u = 1 + \ln x$ .  
ANSWER:  $\frac{7}{3}$
- (c) HINT: Substitution: let  $u = \sin x$ .  
ANSWER:  $2\sqrt{\sin x} + C$
- (d) HINT: Partial fractions:  $\frac{x-2}{x^2(x-1)} = \frac{1}{x} + \frac{2}{x^2} - \frac{1}{x-1}$   
ANSWER:  $\ln|x| - \frac{2}{x} - \ln|x-1| + C$
- (e) HINT: First evaluate the integral from 0 to  $b$  and then take the limit as  $b$  approaches infinity.  
ANSWER:  $\frac{1}{2}$
- (f) HINT: First evaluate the integral from  $b$  to 1 and then take the limit as  $b$  approaches 0 (from the positive direction).  
ANSWER:  $\frac{4}{3}$
- (g) HINT: First evaluate the integral from  $b$  to 1 and then take the limit as  $b$  approaches 0 (from the positive direction).  
ANSWER: This improper integral diverges.
2. (a) HINT:  $w(3.25) - w(0) = \int_0^{3.25} (8t + 1)^{2/3} dt$ . Do substitution with  $u = 8t + 1$ .  
ANSWER:  $\frac{3}{40}(27^{5/3} - 1) = 18.15$  grams
- (b) HINT: Compute  $w(10) - w(2) = \int_2^{10} (8t + 1)^{2/3} dt$ , substitute 29 for  $w(2)$ , and solve for  $w(10)$ .  
ANSWER: 134.30 grams
3. HINT: The area is  $\int_{-1}^4 (x + 28) - (x^4 - 8x^3 + 18x^2) dx$ .  
ANSWER: 62.5
4. HINT: The average value is  $\frac{1}{5} \int_0^{5\pi} x \sin\left(\frac{1}{5}x\right) dx$ . Use integration by parts to do this integral.  
ANSWER: 5
5. ANSWER: Only I is true since the derivative of  $xe^{-x}$  is equal to  $e^{-x}(1 - x)$ . Statement II is not true since the derivative of  $e^{-x}(1 - x)$  is not equal to  $xe^{-x}$ .
6. ANSWER:  $\int_0^1 e^{-x^2} dx \approx 0.8220$