

**Survey of Calculus Final Exam Review – Key  
Fall 2005**

1. a. 6                      b. -9                      c. -1/4

2. a. 3                      b. 3                      c. 3  
d. -1,2                      e. -1, 0, 2                      f. none  
g. -1, 0, 2

3. a.  $4x-3$                       b.  $-1/x^2$

4.  $y = -6x+2$

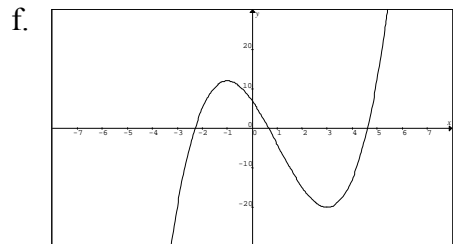
5. a.  $15x^4 - 2x^{-1/2} + 4x^{-3} - \frac{1}{4}x^{-5/4}$   
b.  $6x^{4/3}(2x^{-1/3}) + (3x^{2/3} + 1)(8x^{1/3})$   
c.  $(3x^2 - 5x + 1)(x^{-1/2}) + (2x^{1/2} - 5)(6x - 5)$   
d.  $\frac{9}{2}x^{1/2} - x^{-1/2} - \frac{1}{2}x^{-3/2}$   
e.  $\frac{(x^2 + 1)(-x^{-2} - 1) - (x^{-1} - x)(2x)}{(x^2 + 1)^2}$

f.  $\frac{4-2y-6x}{2x+15y^2}$                       g.  $2e^{2x+1} + \frac{2x-3}{x^2-3x}$

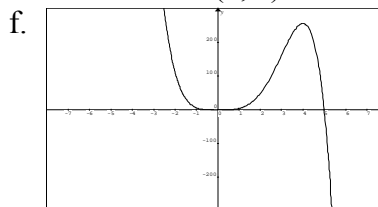
h.  $\frac{1}{4}x^{-1/2}(1+x^{1/2})^{-1/2}$

i.  $4[(x^2 + 1)^3 - x]^3 [3(x^2 + 1)^2(2x) - 1]$

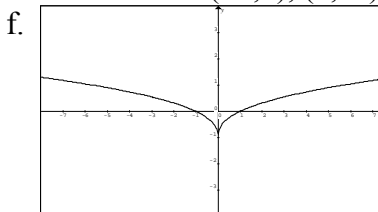
6. i. a. (3, -20), (-1, 12)  
b. Increasing:  $(-\infty, -1), (3, \infty)$   
Decreasing:  $(-1, 3)$   
c. Rel Max: (-1, 12)      Rel Min: (3, -20)  
d. (1, -4)  
e. Con Up: (1,  $\infty$ )      Con Down:  $(-\infty, 1)$



6. ii. a. (0,0), (4, 256)  
b. Inc: (0,4)      Dec:  $(-\infty, 0), (4, \infty)$   
c. Rel Max: (4, 256)      Rel Min: (0,0)  
d.  $x = 0, 3$   
e. Con Up: (0,3),  $(-\infty, 0)$   
Con Down: (3,  $\infty$ )



6. iii. a. (0, -1)  
b. Inc:  $(0, \infty)$       Dec:  $(-\infty, 0)$   
c. Rel Min: (0, -1)      d.  $x = 0$   
e. Con Down:  $(-\infty, 0), (0, \infty)$



7. a.  $\frac{1}{3}x^3 - 9x^{1/3} - 5x^{-1} + 4x + C$   
b.  $\frac{3}{4}x^4 - \frac{4}{3}x^3 + C$                       c.  $\frac{1}{2}x^2 - 2x + C$   
d.  $6t^{7/2} - 4t^{-3/2} + C$                       e.  $9e^{2x/3} + 5\ln|x| + C$   
f.  $\frac{1}{3}(x^2 + 2)^{3/2} + C$                       g.  $\frac{3}{2}e^{x^2} + C$   
h.  $-\frac{1}{2}\ln|1-x^2| + C$                       i.  $2e^{\sqrt{x}} + C$   
j. -1                      k.  $\frac{1}{2}\ln 2$   
l.  $2x^{5/2} - 4x^{3/2} + 4x^{1/2} + C$

$$8. \quad \begin{cases} \text{a.} & \begin{cases} f_x = 4x^3y^3 - 9x^2 + 2y \\ f_y = 3x^4y^2 + 8y + 2x \\ f_{xx} = 12x^2y^3 - 18x \\ f_{yy} = 6x^4y + 8, \quad f_{xy} = 12x^3y^2 + 2 \end{cases} \\ \text{b.} & \begin{cases} f_x = e^{xy}y, \quad f_y = e^{xy}x \\ f_{xx} = y^2e^{xy}, \quad f_{yy} = x^2e^{xy} \\ f_{xy} = e^{xy} + ye^{xy}x \end{cases} \\ \text{c.} & \begin{cases} f_x = \frac{y}{x} + e^y, \quad f_y = \ln x + xe^y \\ f_{xx} = -y/x^2, \quad f_{yy} = xe^y \\ f_{xy} = 1/x + e^y \end{cases} \\ \text{d.} & \begin{cases} f_x = 3x^{-2/3}y^{1/2} - 4y^2 \\ f_y = \frac{9}{2}x^{1/3}y^{1/2} - 8xy \\ f_{xx} = -2x^{-5/3}y^{1/2} \\ f_{yy} = -\frac{9}{4}x^{1/3}y^{-3/2} - 8x \\ f_{xy} = \frac{3}{2}x^{-2/3}y^{-1/2} - 8y \end{cases} \end{cases}$$

19.  $E(50) = 1$ ; no; unitary elasticity means revenue is already maximized.

20. 8.25 sq units;  $32/3$  sq units

21. a. 8 sq units      b.  $e - 1$  square units

22. 28.5 words

23.  $104/3$

24. \$1640

25. 500; \$20,000; \$10,000

26. a.  $4/3$  sq units      b.  $1/12$  sq units  
c. 32 sq units

27. 2000 \$18 gloves and 3000 \$25 gloves

28. 90 deg air temp and 70 deg water temp

29. 24 at (2,4)

30. -96 at (4, -12)

31. 3 in by 3 in by 5 in

9. 56 mph

10.  $MC(x) = 3 - 27x^{-3/2}$ ,  $MC(9) = \$2/\text{unit}$   
When 9 units are produced, the cost is increasing at a rate of \$2 per unit.

11. 0.08 units/cm

12. 1800 sq ft

13. 10 in by 10 in by 5 in

14. Price: \$2400 each      Quantity: 9 per week

15. \$170; 18 machines

16.  $-600 \text{ in}^3/\text{hr}$

17.  $-0.06 \text{ cc/hr}$ ;  $-0.0543 \text{ cc/hr}$

18.  $1/2$ ; raise price