Answers to Spring 2017 Final Exam

1. (a) 
$$1 + \frac{3}{2(3x+1)}$$
  
(b)  $\frac{7}{5}x^5 - \frac{35}{2}x^2 + 10\ln x - \frac{2}{3}x^3 + C$   
(c)  $e + \frac{7}{e} - 8 \approx -2.71$ 

- 2. (a)  $MP(20) \approx 4.5 3.5 = 1$  dollar increase.
  - (b)  $TC(13) TC(0) = \int_0^{13} MC(x) dx = \frac{117}{2}$  so FC = TC(0) = 8 hundred dollars.
  - (c) When x = 16 hundred things,  $P(16) P(0) = \int_0^{16} MR(x) MC(x) dx \approx -20$  so P(16) = -20 + P(0) = -20 FC = -28 hundred dolars.
  - (d) When area between MR and MC to the right of x = 16 equals 28. About 29.5 things.
- 3. (a) P(20) = 19.2 meters per seconds away from the house.
  - (b)  $P(t) = 0.05t^3 1.2t^2 + 7.2t + 12.825$ , so P(0) = 12.825 meters from the house.
  - (c) When C' = p at t = 2.915 seconds, a distance of P(2.915) C(2.915) = 21.606 meters.
- 4. (a) Local max at x = -1, local min at x = 3.
  - (b) x < -1 or x > 3.
  - (c) x > 1
  - (d) (-1, 20), (3, -12), (1, 4), (0, 15).



- 5. (a) TP(20) = 279,200 dollars.
  (b) \$22,000
- 6. (a) Consumers' Surplus =  $\int_0^{16} \frac{63}{0.05x + 2} dx 16 \cdot 22.5 = 1260 \ln(1.4) 360 \approx 63.955.$



- 7. (a)  $f_x(x,y) = 6x + 0.2ye^{0.2xy}$ .
  - (b)  $f_y(x,y) = \frac{1}{y+1} + 0.2xe^{0.2xy}$ .
  - (c)  $f_x(2,3) = 12 + 0.6e^{1.2}$
  - (d) The slope of f(x, 2) at x = 1 is  $f_x(1, 2) = 6 + 0.4e^{0.4}$ .
  - (e)  $\frac{f(7.000000001,3) f(7,3)}{0.000000001} \approx f_x(7,3) = 42 + 0.6e^{4.2}.$
  - (f) After having produced 2700 boxes of mint and 4300 boxes of chocolate ice cream, the cost of producing the next box of mint ice cream is approximately \$24.97 dollars.
- 8. R(15, 22) C(15, 22) = 261 thousand dollars.