## Answers to Spring 2017 Final Exam

1. (a) $1+\frac{3}{2(3 x+1)}$
(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) $M P(20) \approx 4.5-3.5=1$ dollar increase.
(b) $T C(13)-T C(0)=\int_{0}^{13} M C(x) d x=\frac{117}{2}$ so $F C=T C(0)=8$ hundred dollars.
(c) When $x=16$ hundred things, $P(16)-P(0)=\int_{0}^{16} M R(x)-$ $M C(x) d x \approx-20$ so $P(16)=-20+P(0)=-20-F C=-28$ 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) $P(t)=0.05 t^{3}-1.2 t^{2}+7.2 t+12.825$, so $P(0)=12.825$ meters from the house.
(c) When $C^{\prime}=p$ 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) $(-1,20),(3,-12),(1,4),(0,15)$.
(e)

5. (a) $T P(20)=279,200$ dollars.
(b) $\$ 22,000$
6. (a) Consumers' Surplus $=\int_{0}^{16} \frac{63}{0.05 x+2} d x-16 \cdot 22.5=1260 \ln (1.4)-360 \approx 63.955$.
(b) Area $\approx 72$

7. (a) $f_{x}(x, y)=6 x+0.2 y e^{0.2 x y}$.
(b) $f_{y}(x, y)=\frac{1}{y+1}+0.2 x e^{0.2 x y}$.
(c) $f_{x}(2,3)=12+0.6 e^{1.2}$
(d) The slope of $f(x, 2)$ at $x=1$ is $f_{x}(1,2)=6+0.4 e^{0.4}$.
(e) $\frac{f(7.000000001,3)-f(7,3)}{0.000000001} \approx f_{x}(7,3)=42+0.6 e^{4.2}$.
(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.
