

Math 148 Quiz #5 Answers

1. (a) $MC(q) = C'(q) = \boxed{q^2 - 70q + 1300}$

(b) Since $MC(30) = 100$ and $MR(30) = 500$, $\boxed{\text{you should increase production after producing 30 items.}}$
Since $MC(60) = 700$ and $MR(60) = 500$, $\boxed{\text{you should not increase production after producing 60 items.}}$

(c) Solving $MC = MR$: $q^2 - 70q + 1300 = 500 \Rightarrow q^2 - 70q + 800 = 0 \Rightarrow q = \frac{70 \pm \sqrt{1700}}{2}$
 $\Rightarrow q \approx 14.38$ or $q \approx 55.62$

From part (b), we see that $MR > MC$ before $q \approx 55.62$ and that $MC > MR$ after $q \approx 55.62$. So, we have maximized profit when $\boxed{q \approx 56 \text{ items.}}$

(d) $AC(30) = \frac{C(30)}{30} = \frac{16,700}{30} \approx \boxed{556.67 \text{ dollars/unit}}$

2. (a) $\int 2z^3 - z^{1/3} + 5 \, dz = \boxed{\frac{1}{2}z^4 - \frac{3}{4}z^{4/3} + 5z + C}$

(b) $\int x \cdot e^{5x^2} \, dx = \boxed{\frac{1}{10}e^{5x^2} + C}$

(Using the substitution $u = 5x^2 \Rightarrow du = 10x \, dx$ or $\frac{1}{10} du = x \, dx$)

(c) $\int 8t^3(t^4 + 5)^6 \, dt = \boxed{\frac{2}{7}(t^4 + 5)^7 + C}$

(Using the substitution $u = t^4 + 5 \Rightarrow du = 4t^3 \, dt$)