HW #13

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Data 605
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1. $\int 4e^{-7x}\,dx$; $u = -7x \rightarrow -\frac{1}{7}du = dx$, substitute

$\int 4e^{u} \cdot -\frac{1}{7}du \rightarrow -\frac{4}{7}\int e^{u}du \rightarrow \boxed{-\frac{4}{7}(e^{u}+c)}$

2. $\frac{dN}{dt} = -3150/t^{+4} - 220 = N'$

$\int N'dt \rightarrow \int(-3150/t^{+4} - 220)\,dt$

$N(t) = \frac{1050}{t^3} - 220t + c$

@ $t=1$ & 6530

$6530 = \frac{1050}{1^3} - 220\cdot 1 + c$

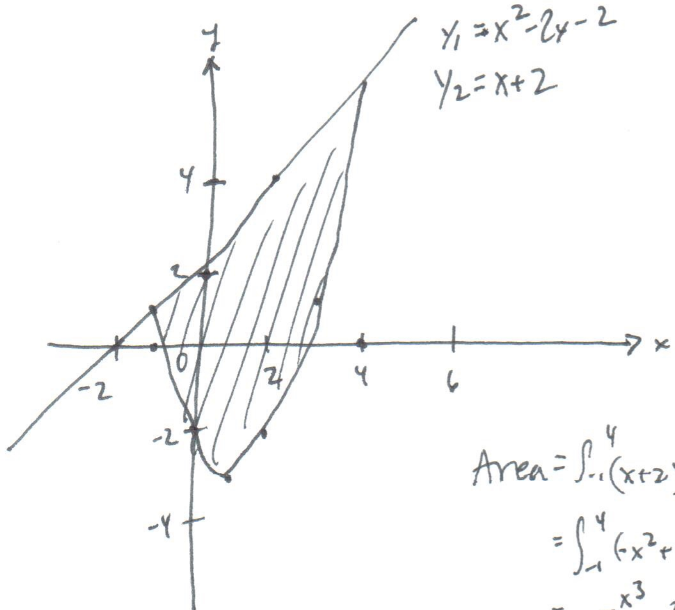
$c = 6530 - 1050 + 220$

$\boxed{c = 5700}$

3. each rectangle is 1 unit wide and each one is incrementing in height by two units.

Area $= 1\cdot 1 + 3\cdot 1 + 5\cdot 1 + 7\cdot 1$
$= 16$

4.



intercepts

$y_1 = y_2$

$x + 2 = x^2 - 2x - 2$

$0 = x^2 - 3x - 4$

$0 = (x-4)(x+1)$

$x \in [-1, 4]$

Area $= \int_{-1}^{4}(x+2)dx - \int_{-1}^{4}(x^2-2x-2)dx$

$= \int_{-1}^{4}(-x^2+3x+4)dx$

$= -\frac{x^3}{3} + \frac{3x^2}{2} + 4x \Big|_{-1}^{4}$

$= (-\frac{64}{3} + \frac{48}{2} - 16) - (+\frac{1}{3} + \frac{3}{2} + 4)$

$\frac{35}{2}$ ~~220~~ $- 3\frac{1}{3}$

$\boxed{= 20.83}$

5. $n \cdot x = 110$

$x = \frac{110}{n}$

$C = 8.25n + 3.75\frac{x}{2}$

$= 8.25n + \frac{3.75}{2} \cdot \frac{110}{n}$

deriv to get optimal

$0 = 8.25 - \frac{3.75}{2} \cdot \frac{110}{n^2}$

$n^2 = \frac{206.25}{8.25}$

$n = \sqrt{25} = 5$

@ $n=5$ $\quad x = 22$

$\boxed{\text{5 orders per years each 22 units}}$

6. $\int \ln(9x) \cdot x^6 \, dx$

IBP uv

$u = \ln(9x)$

$dv = x^6 \, dx$

$v = \frac{1}{7}x^7$

$du = \frac{1}{x}$

$\int u\,dv = uv - \int v\,du$

$= \ln(9x) \cdot \frac{1}{7}x^7 - \int \frac{1}{7}x^7 \cdot \frac{1}{x}$

$- \int \frac{x^6}{7}$

$$\boxed{= \frac{1}{7}x^7 \ln(9x) - \frac{1}{49}x^7 + C}$$

7. $\int_1^{e^6} \frac{1}{6x} dx = \frac{1}{6}\int_1^{e^6} \frac{1}{x} dx = \frac{1}{6}\ln(x)\Big|_1^{e^6} \rightarrow \frac{1}{6}(\ln(e^6) - \ln(1))$

always

$= \frac{1}{6}((6) - 0)$

$= 1$

$\boxed{\text{the PDF must be equal to 1 for integral range. So range is valid.}}$