No calculators allowed.

(65 pts.)

MAC 2233 EXAM II MR. NADEL SUMMER 2017

(15) (1) a) $\int (e^{-3x} + (x+2)^{100} + x^{-1})\,dx$

b) $\int (x^{3/4} - 2x) \cdot x^{1/2}\,dx$

c) Eggs currently cost \$1.60 per dozen. x weeks from now, the price will be changing at the rate of $0.3 + 0.004x^2$ cents per week. How much will eggs cost 10 weeks from now? (Hint: \$1.60 = 160¢)

(15) (2) a) $\int x e^{(3x^2-1)}\,dx$

b) $\int \frac{1}{x(\ln x)^5}\,dx$

c) t years from now, the population of a country will change at the rate of $e^{.03t}$ million per year. If the current population is 30 million, find a formula for the population, $P(t)$.

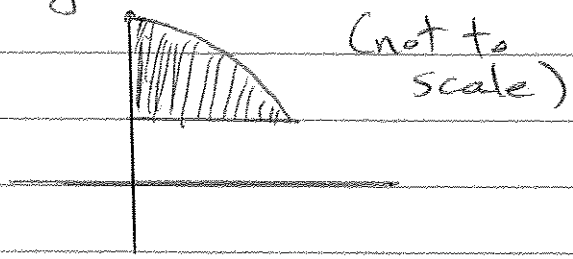
(20) (3) a) $\int_1^3 \left(e^x + \frac{3}{x}\right)dx$

b) $\int_0^4 \left(\sqrt{x} + 2x^2 + 3x^3\right)dx$

(3) c) $\int_0^3 x^2\sqrt{x^3+9}\,dx$

d) The marginal cost is $3(q-4)^2$ dollars per unit, when q units are produced. By how much will the total manufacturing cost increase if the level of production is raised from 5 units to 9 units?

(10) (4) Find the area, in quadrant I, between $y=9$ and $y = 25 - x^2$.



(5) (5) A manufacturer supplies $S(p) = 0.4p^2 + 3p + 8$ hundred units of a commodity when the price is p dollars per unit. Find the average supply as the price varies from $p = \$1$ to $p = \$4$.

MAC 2233 EXAM III KEY (SU '17)

(1) a) $\frac{e^{-3x}}{-3} + \frac{(x+2)^{101}}{101} + \ln|x| + C$

b) $\int (x^4 - 2x^{3/2})\,dx$

$= \frac{x^3}{3} + 2\left(\frac{2}{5}\right)x^{5/2} + C$

$= \frac{1}{3}x^3 + \frac{4}{5}x^{5/2} + C$

c) $\frac{dC}{dx} = 0.3 + 0.004x^2$

$C = 0.3x + \frac{0.004}{3}x^3 + 160$

$C(10) = 0.3(10) + \frac{.004(1000)}{3} + 160$

$= 164 \text{¢} = \$1.64$

(2) a) $u = 3x^2 - 1 \quad du = 6x\,dx$

$\frac{1}{6}du = x\,dx$

$\frac{1}{6}\int e^u\,du = \frac{1}{6}e^u + C$

$= \frac{1}{6}e^{(3x^2-1)} + C$

b) $u = \ln x, \quad du = \frac{1}{x}dx$

$\int u^{-5}\,du = \frac{u^{-4}}{-4} + C$

$= \frac{(\ln x)^{-4}}{-4} + C$

c) $P = \int e^{.03t}\,dt = \frac{e^{.03t}}{.03} + C$

$P(0) = 30 = \frac{100}{3} + C \Rightarrow C = -\frac{10}{3}$

$P(t) = \frac{e^{.03t}}{.03} - \frac{10}{3}$

(3) a) $\left(e^x + 3\ln|x|\right)\Big|_1^3$ Note: $\ln 1 = 0$

$= e^3 + 3\ln 3 - e.$

b) $\left(\frac{2}{3}x^{3/2} + \frac{2}{3}x^3 + \frac{3}{4}x^4\right)\Big|_0^2$

$= \frac{2}{3}(2)^{3/2} + \frac{2}{3}(8) + \frac{3}{4}(16)$

(3) c) $u = x^3 + 9, \quad du = 3x^2dx, \quad \frac{1}{3}du = x^2dx$

$\frac{1}{3}\int_9^{36} u^{1/2}\,du = \frac{1}{3}\cdot\frac{2}{3}u^{3/2}\Big|_9^{36}$

$= \frac{2}{9}(216 - 27) = \frac{378}{9}$

d) $\int_5^9 3(q-4)^2\,dq$

$= (q-4)^3\Big|_5^9$

$= 5^3 - 1^3 = 125 - 1 = 124$

(4) $25 - x^2 = 9 \Rightarrow x = \pm 4$

$\int_0^4 (25 - x^2 - 9)\,dx$

$= \int_0^4 (16 - x^2)\,dx = \left(16x - \frac{x^3}{3}\right)\Big|_0^4$

$= 64 - \frac{64}{3} = \frac{128}{3}$

(5) $\frac{1}{4-1}\int_1^4 (0.4p^2 + 3p + 8)\,dp$

$= \frac{1}{3}\left(\frac{0.4p^3}{3} + \frac{3p^2}{2} + 8p\right)\Big|_1^4$

$= \frac{1}{3}\left[\frac{0.4(4)^3}{3} + \frac{3(4)^2}{2} + 8(4) - \left(\frac{0.4}{3} + \frac{3}{2} + 8\right)\right]$