

Show all work as necessary on separate paper.

Turn in all work sheets.

1. $\int (12x^3 + 3x^2 - 5) dx$

2. $\int \left(\frac{4x^4 + 4x^2 - x - 1}{x} \right) dx$

3. $\int (6e^{3x} - 3e^{-x}) dx$

4. $\int \frac{x^2 - x - 2}{\sqrt{x}} dx$

5. Find the area under the curve $f(x) = 9 - 3\sqrt{x}$ from $x=0$ to $x=9$. Show work by algebra/calculus methods. (you may check with calculator methods!)

6. $\int_1^3 (9x^2 + x^{-1}) dx$ Show work by algebra/calculus methods. Give exact answer. Use calculator to check.

7. Find the area between the parabola $y = x^2 + 5$ and the straight line $y = 3x + 9$. Sketch the graph.

8. $\int e^{x^3} x^2 dx$

9. $\int \frac{(\ln x)^3}{x} dx$

10. $\int \frac{x dx}{x^2 + 1}$

11. $\int_0^3 e^{x^3} x^2 dx$

12. A car can accelerate from standing start to a speed of $v(t) = -0.09t^2 + 8t$ ft/sec after t seconds for $0 \leq t < 35$

a) Find a formula for the distance it travels in the first t seconds

b) How far does the car travel in the first 10 seconds?

13. World copper consumption is running at the rate of

$13e^{0.04t}$ million tons per year beginning at $t=0$ in yr. 2000.

a) Find a formula for the total amount of copper used t years after year 2000. (Be sure to find the constant c !)

b) How many years will it take to use up 600 million tons?

MAC 2233 EXAM 4A Solutions

1. $\int (12x^3 + 3x^2 - 5) dx$
 $\frac{12x^4}{4} + \frac{3x^3}{3} - 5x + C$
 $3x^4 + x^3 - 5x + C$

2. $\int \frac{4x^4 + 4x^2 - x - 1}{x} dx$
 $\int (4x^3 + 4x - 1 - \frac{1}{x}) dx$
 $\frac{4x^4}{4} + \frac{4x^2}{2} - x - \ln|x| + C$
 $x^4 + 2x^2 - x - \ln|x| + C$

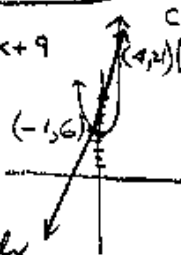
3. $\int (6e^{3x} - 3e^{-x}) dx$
 $\frac{6e^{3x}}{3} - 3\frac{e^{-x}}{-1} + C$
 $2e^{3x} + 3e^{-x} + C$

4. $\int \frac{x^2 - x - 2}{\sqrt{x}} dx$
 $\int (x^{3/2} - x^{1/2} - 2x^{-1/2}) dx$
 $\frac{2x^{5/2}}{5} - \frac{2x^{3/2}}{3} - 2 \cdot 2x^{1/2} + C$
 $\frac{2}{5}x^{5/2} - \frac{2}{3}x^{3/2} - 4x^{1/2} + C$

5. $\int_0^9 (9 - 3\sqrt{x}) dx$
 $9x - \frac{3 \cdot 2x^{3/2}}{3/2} \Big|_0^9$
 $81 - 2 \cdot 2 \cdot \sqrt{2} = (0-0)$
 $81 - 2 \cdot 27$
 $81 - 54 = 27$

6. $\int_1^3 (9x^2 + x^{-1}) dx$
 $\frac{9x^3}{3} + \ln|x| \Big|_1^3$
 $\frac{9 \cdot 27}{3} + \ln 3 - (\frac{9}{3} + \ln 1)$
 $81 + \ln 3 - 3$
 $78 + \ln 3 \approx 79.0986$
 79.10

7. $y = x^2 + 5$ $y = 3x + 9$
 $x^2 + 5 = 3x + 9$
 $x^2 - 3x - 4 = 0$
 $(x-4)(x+1) = 0$
 $x = 4$ $x = -1$



$\int_{-1}^4 (3x+9) - (x^2+5) dx$
 $\int_{-1}^4 (3x+4-x^2) dx$
 $\frac{3x^2}{2} + 4x - \frac{x^3}{3} \Big|_{-1}^4$
 $(\frac{3 \cdot 16}{2} + 16 - \frac{64}{3}) - (\frac{3}{2} - 4 + \frac{1}{3})$
 $24 + 16 - \frac{64}{3} - \frac{3}{2} + 4 - \frac{1}{3}$
 $44 - \frac{65}{3} - \frac{3}{2} = \frac{125}{6}$
 $\text{fnInt}(3x+9-x^2=5, x, -1, 4) = 20.8\bar{3}$

Ch: Calculator
 (4,2) [2nd] [CALC] [fnInt]

check: [2nd] [CALC] [fnInt]

8. $\int e^{x^3} x^2 dx$ let $u = x^3$
 $du = 3x^2 dx$
 $\frac{du}{3} = x^2 dx$
 $\int \frac{1}{3} e^u du = \frac{1}{3} e^u + C = \frac{1}{3} e^{x^3} + C$

11. $\int_0^3 e^{x^3} x^2 dx$
 $\frac{1}{3} e^{x^3} \Big|_0^3$
 $\frac{1}{3} e^{27} - \frac{1}{3} e^0$
 $\frac{1}{3} (e^{27} - 1)$
 177349413534
 (1.77×10^{11})

9. $\int \frac{(\ln x)^3}{x} dx$ let $u = \ln x$
 $du = \frac{1}{x} dx$
 $\int u^3 du = \frac{u^4}{4} + C$
 $\frac{1}{4} (\ln x)^4 + C$

fnInt(e^{x^3} , x, 0, 3)
 It takes a LONG time, but it works

10. $\int \frac{x dx}{x^2+1}$ let $u = x^2+1$
 $du = 2x dx$
 $\frac{du}{2} = x dx$
 $\frac{1}{2} \int \frac{du}{u} = \frac{1}{2} \ln|u| + C = \frac{1}{2} \ln(x^2+1) + C$

(13) continued

12. $v(t) = -.04t^2 + 8t$
 $s(t) = -\frac{.04t^3}{3} + \frac{8t^2}{2} + C$
 $= -.03t^3 + 4t^2 + C$
 $s(0) = 0, \text{ so } C = 0$
 a) $s(t) = -.03t^3 + 4t^2$
 b) $s(10) = -.03(10^3) + 4(10^2)$
 $\text{FRY}_2 = -30 + 400 = 370 \text{ ft.}$
 $\text{fnInt}(-.04x^2 + 8x, x, 0, 10)$

13. Rate = $13e^{0.04t}$
 a) $A(t) = \int 13e^{0.04t} dt$
 $A(t) = \frac{13}{.04} e^{0.04t} + C$
 $0 = 325e^0 + C$
 $C = -325$

b) $A(t) = 325e^{0.04t} - 325$
 $600 = 325e^{0.04t} - 325$
 $925 = 325e^{0.04t}$
 $\frac{925}{325} = e^{0.04t}$
 $\ln(\frac{925}{325}) = \ln e^{0.04t} = .04t$
 $t = \frac{\ln(\frac{925}{325})}{.04} \approx 26.15$
 4 yrs.