

Pencil and Paper homework Number 1

This homework reviews Definite Integrals and u-substitutions. and area under curves. Remember to make it look like you did it by hand even if you did it on your computer.

1) Find the definite integrals.

a) $\int_{-1}^3 x^2 - 3x dx$

b) $\int_0^{2\pi} \sin(x) dx$

c) $\int_0^1 e^x dx$

d) $\int_0^1 \frac{1}{1+x^2} dx$

e) $\int_0^{\frac{1}{2}} \frac{1}{\sqrt{1-x^2}} dx$

2) Find the definite integrals by using a simple u-substitution. First do the indefinite integral and then put in the limits. One of these cannot be done.

a) $\int_{-1}^3 x(x^2 - 3)^3 dx$

b) $\int_0^{2\pi} \sin(3x) dx$

c) $\int_0^1 (x - \frac{1}{2})e^{x^2-x} dx$

d) $\int_0^1 \frac{1}{1+4x^2} dx$

e) $\int_0^{\frac{1}{2}} \frac{1}{\sqrt{1-9x^2}} dx$

f) $\int_0^{\frac{1}{5}} \frac{1}{\sqrt{1-9x^2}} dx$

3) Find the area between the curve and the x-axis. If no limits are given you must find them You may have to use a u-substitution to finish the problem.

a) $f(x) = 4 - x^2$

b) $f(x) = \sin(2x)$ between 0 and $\frac{\pi}{2}$

c) $f(x) = x$ between 0 and 1

d) $f(x) = x^2$ between 0 and 1

e) $f(x) = x^3$ between 0 and 1

f) $f(x) = x^4$ between 0 and 1 (Notice any pattern?)

g) $f(x) = \tan(x)$ between 0 and $\frac{\pi}{4}$

h) $f(x) = xe^{x^2}$ between 0 and 2

4) Use the following trig formulas to do the definite integrals. You may have to do the trick twice or more.

$$\sin^2 \theta = \frac{1}{2}(1 - \cos 2\theta) \qquad \cos^2 \theta = \frac{1}{2}(1 + \cos 2\theta)$$

a) $\int_0^{\pi/4} \sin^2 x \, dx$

b) $\int_0^{\pi/4} \cos^2 2x \, dx$

c) $\int_0^{\pi/16} \sin^2 4x \, dx$

d) $\int_0^{\pi} \sin^4 x \, dx$

For the last one, use $\sin^4 x = (\sin^2 x)^2$, put in what $\sin^2 x$ is, square it, and then use the formulas again to finish the problem.