Calculus II

Daily Quiz 2-2

October 17, 2025

Please write your name on the top of the paper. All of these problems require u-substitution of some form. If one is particularly tricky I have included a hint.

i) Evaluate the following integral:

$$\int_0^2 \frac{3x^2}{1+x^3}dx$$

ii) Evaluate the following integral:

$$\int_0^{\ln(10)} x^2 e^{x^3} dx$$

iii) Evaluate the following integral:

$$\int_0^{\sqrt{\pi}} \frac{x\sin(x)}{\cos(x^2)+4}dx$$

iv) Evaluate the following integral (do not use an inverse trig function here!)

$$\int_2^4 \frac{2x}{\sqrt{1+x^2}}dx$$

v) Evaluate the following integral:

$$\int_0^{\ln 3} \frac{e^x}{(e^x+1)^2}dx$$

vi) Evaluate the following integral:

$$\int 6xe^{3x^2-x} - e^{3x^2-x}dx$$

vii) Evaluate teh following integral (hint: factor out 4 from the square root by writing $4 - x^2$ as $4(1 - x^2/4)$, then apply u-substitution and use an inverse trig function):

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

viii) Evaluate the following integral:

$$\int e^x \sec^2(e^x) dx$$

ix) Evaluate the following integral:

$$\int \frac{\ln x}{x} dx$$

x) A particles velocity (in meters per second) relative to the 0 are on the real number line is given by:

$$v(t) = \frac{2x + 3}{x^2 + 3x + 5}$$

Find the total distance traveled over the time interval $[1, 3]$.

xi) A particles acceleration in (meters per second squared) relative to 0 ont the real number line is given by:

$$a(t) = \frac{e^{\sqrt{x}}}{\sqrt{x}}$$

Assuming the particle started accelerating at $t = 0$ seconds, find the total change in velocity after $\ln(3)^2$ seconds.

xii) A particles velocity (in meters per second) relative to 0 on teh real number line is given by:

$$v(t) = \sqrt{9 - t^2}$$

If $x(0) = 1\,\mathrm{m}$, find $x(t)$. (Hint: make the substitution $t = 3 \sin u$).

xiii) The snow is falling at a rate of:

$$s(t) = \frac{\sin t}{1 + \cos t}$$

where t is hours after 8am, and $s(t)$ has units inches of snowfall per hour. Find how much snow has built up at 2pm.

xiv) The snow started falling at 2 pm, and is falling at a rate of:

$$s(t) = \frac{1}{\sqrt{t^2 - 1}}$$

where t is hours after 12 pm. The units are the same as the previous problem. If at 4pm, the amount of built up snow is 4 inches, find $f(t)$, the total snow fall as a function of t. (Hint: make the substitution $t = \sin(u)$.)

xv) Water is linking out of a tank at a rate of:

$$v(t) = \frac{1}{t \ln t}$$

where t is hours after 3pm. If at 5pm the total water in the tank is $100\,\mathrm{m}^3$, find the water level $w(t)$ as a function of time. Find the water level at 6 pm. (Hint: if water is leaking out of a tank you should probably subtract the integral instead of add!)