TMATH 125 Quiz 2

Key

Show *all* your work (numerically, algebraically, or geometrically) for each and simplify. No credit is given without supporting work.

1. Let $g'(x) = 225e^{1.5x}$ and $g(0) = 150$.

notation (+.5)

(a) [3] (WebHW4 #2) Find g.

(+1)

g is an antiderivative of g'

$\int 225e^{1.5x}\,dx = 225\int e^{1.5x}\,dx$

let $u = 1.5x$
$du = 1.5\,dx$
$\Rightarrow \frac{1}{1.5}du = dx$

$= 225\int e^{u}\frac{1}{1.5}du = \frac{225}{1.5}\int e^{u}du$

$= \frac{225}{1.5}e^{u} + c = \frac{225}{1.5}e^{1.5x} + c$ (+.5)

$3\overline{)225.0} = 150$; -15; 75; -75; 0

(+1)

Since $g(0) = 150$ we know $150 = \frac{225}{1.5}e^{1.5 \cdot 0} + c$

$\Rightarrow 150 = 150 \cdot 1 + c \Rightarrow c = 0$ so $g(x) = 150e^{1.5x}$

(b) [2] (indef integral wks #2) A honeybee population starts with 150 bees and grows exponentially (for a while) at a rate of $225e^{1.5t}$ were t is measured in weeks. Find the number of bees that were added between week 1 and week 5.

same (+.5)
got it (+.5)
work (+1)

From (a) we've already found a function for the population (p) of bees in week t, mainly $p(t) = 150e^{1.5t}$. We could simply compute $p(5) - p(1)$.

$150e^{1.5(5)} - 150e^{1.5(1)}$ bees

We could also use the rate and redo the integration by considering $\int_1^5 225e^{1.5t}\,dt = 150e^{1.5(5)} - 150e^{1.5(1)}$ bees

Either way, same answer.

2. [2] (WebHW5 #5) Evaluate the indefinite integral: $\int \frac{\sin(\ln(13x))}{x}\,dx$.

notation (+.5)
sub/right (+1)
plus c (+.5)

let $u = \ln(13x)$

$du = \frac{1}{13x} \cdot 13\,dx$

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

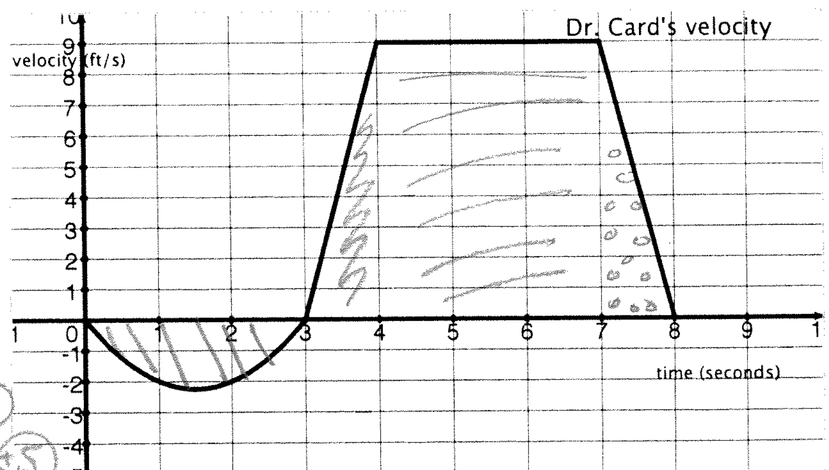
$\int \frac{\sin u}{1} \cdot \frac{1}{x}\,dx$

$\int \sin u \, du = -\cos u + c$

$= -\cos(\ln(13x)) + c$

3. [3] (§5.4 #60) Dr. Card ran a race and had his velocity tracked on the graph below. Find the total distance he ran during the race using what ever methods you like, but make sure you compute the distance exactly.

$$f(x) = \begin{cases} x(x-3) & \text{if } 0 \le x \le 3 \\ 9x - 27 & \text{if } 3 < x \le 4 \\ 9 & \text{if } 4 < x \le 7 \\ -9x + 72 & \text{if } 7 < x \le 8 \end{cases}$$



abs value (+.5)
area under curve (+.5)
set up integral (+.5)
computed right (+.5)
easy areas (+.5)
notation/got it (+.5)

distance traveled during specified time interval

$\left|\int_0^3 x(x-3)\,dx\right| + \frac{1}{2}\cdot 1 \cdot 9 + 3 \cdot 9 + \frac{1}{2}\cdot 1 \cdot 9$

$= \left|\int_0^3 x^2 - 3x\,dx\right| + \frac{9}{2} + 27 + \frac{9}{2}$

$= \left|\left[\frac{1}{3}x^3 - \frac{3}{2}x^2\right]_0^3\right| + 36$

$= \left|\left(\frac{1}{3}(3)^3 - \frac{3}{2}(3)^2\right) - \left(\frac{1}{3}\cdot 0^3 - \frac{3}{2}\cdot 0^2\right)\right| + 36 = \left|9 - \frac{27}{2}\right| + 36$

$= \left|\frac{18}{2} - \frac{27}{2}\right| + 36 = \left|\frac{-9}{2}\right| + 36 = \frac{9}{2} + 36 = \frac{81}{2}$