Mathematics 122 Test #3 Name: Key

You are to use your own calculator, no sharing.
Show your work to get credit.

(1) (10 points) Use your calculator to compute

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

fnInt(3^X − X^2, X, −2, 3) = 12.80865...

(b) $\int_{-1}^{4} \frac{t^2+3}{e^{t+1}+2}\,dt$

fnInt((X^2+3)/(e^(X+1)+2), X, −1, 4) = 2.2344...

(2) (8 points) The driver of a car hits the brakes and the car slows to a stop in two seconds. The speed of the car, v, as a function of the time, t, since the brakes were first applied is recorded in the following table

t in seconds	0.0	0.5	1.0	1.5	2.0
v in ft/sec	25	20	15	8	0

Give upper, lower, and best guess estimates for the distance the care has traveled.

.5(25+20+15+8) Upper estimate = 34

.5(20+15+8+0) Lower estimate 21.5

Best Guess 27.75

$\frac{34+21.5}{2}$

(3) (7 points) A snowball weighting 32 oz is brought indoors. Due to melting it loses weight at a rate of

$$r(t) = 3(1 - (.8)^t) \text{ oz/min}$$

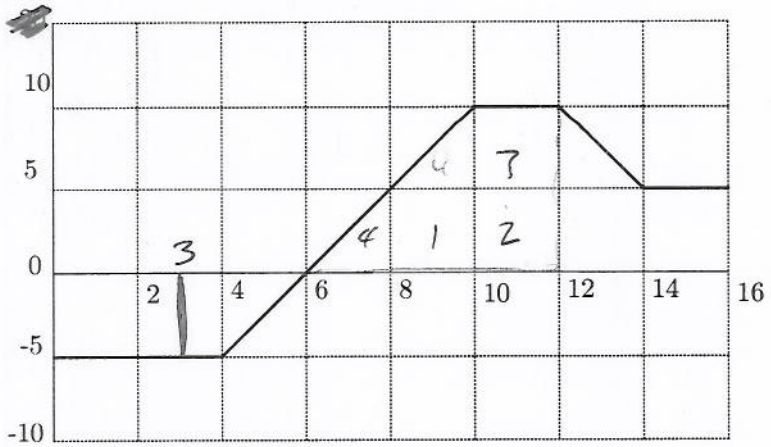
where t is the number of minutes since it was brought inside. What is the snowball's weight 10 minutes after it was brought inside?

$32 - \int_0^{10} 3(1-(.8)^t)\,dt$

= 32 − fnInt(3(1−(.8)^X), X, 0, 10)

Weight is 14.00069...

(4) (12 points) The graph of $y = f(x)$ is given below.



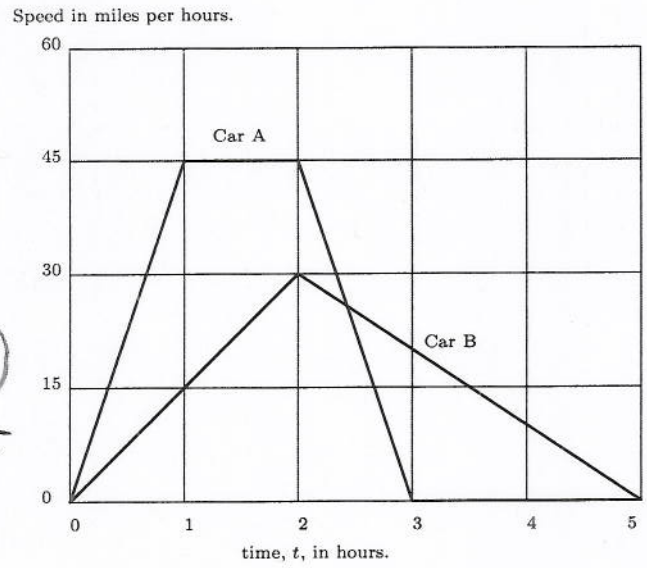
1 box = 2·5 = 10

(a) What is $\int_6^{12} f(x)\,dx$? = 4 (boxes) = 40

(b) What is $\int_0^4 f(x)\,dx$? = −2 (boxes) = −20

(c) What is $\int_3^{10} f(x)\,dx$? = (−1 + 2) boxes = 10

(5) (13 points) The following graph shows the speeds of two cars, A and B, over a five hour period.



dist. for A = Area(△□△)
= Area(△) + Area(□) + Area(△)
= ½(1)(45) + 45 + ½(1)(45)
= 90

dist. for B = Area(△)
= ½(5)(30)
= 5·15 = 75

(a) Which car obtains the greatest speed? A

(b) How far does Car A travel? 90 miles

(c) How far does Car B travel? 75 miles

(6) (5 points) If $f(t)$ is measured in gallons/hour and t is measured in hours, then that are the units of $\int_a^b f(t)\,dt$.

(units of f) $\times$ (units of t)

$= \left(\frac{\text{gallons}}{\text{hr}}\right)(\text{hr}) = \text{gallons}$

Units are gallons

(7) (10 points) A student decides to make a little money by selling solutions to the even numbered problems in the Math 122 book. His fixed costs for this project are \$75.00 and his marginal cost of producing the q-th book is

$$MC(q) = 1 + 2(.7)^q \text{dollars/book}$$

What does it cost him to produce 50 books?

$C(0) =$ fixed costs $= \$75$

$MC(q) = C'(q)$.

$C(50) = C(0) + \int_0^{50} (1 + 2(.7)^q)\,dq$

$= 75 + \text{fnInt}(1+2(.7)^{\wedge}X, X, 0, 50)$

Cost of producing 50 books \$130.61

(8) (15 points) Compute the following

(a) The antiderivative of $f(x) = 12x^3 + 9x^2 + 4x + 2$

$F(x) = \frac{12}{4}x^4 + \frac{9}{3}x^3 + \frac{4}{2}x^2 + 2x$

$F(x) = 3x^4 + 3x^3 + 2x^2 + 2x$

(b) The antiderivative of $g(u) = \frac{6}{\sqrt{u}} + \frac{12}{u^5}$

$g(u) = 6u^{-\frac{1}{2}} + 12u^{-5}$ $G(u) = 6(2)u^{\frac{1}{2}} + \frac{12}{-4}u^{-4}$

$G(u) = 12u^{\frac{1}{2}} - 3u^{-4}$

(c) $\int 9e^{3z}\,dz = \frac{9}{3}e^{3z} = 3e^{3z}$

$\int 9e^{3z}\,dz = 3e^{3z}$

(9) (8 points) If b is a constant compute $\int_0^b (b - t)\,dt$.

$= \left(bt - \frac{t^2}{2}\right)\Big|_0^b = \left(b \cdot b - \frac{b^2}{2}\right) - (0 - 0)$

$= b^2 - \frac{b^2}{2} = \frac{b^2}{2}$

$\frac{b^2}{2}$

(10) (7 points) A parachutist's speed t seconds after jumping from a plane is

$$v(t) = 120(1 - (.8)^t) \text{ ft/sec}$$

If the parachute is opened 20 seconds after jumping, what is the average speed during this 20 seconds?

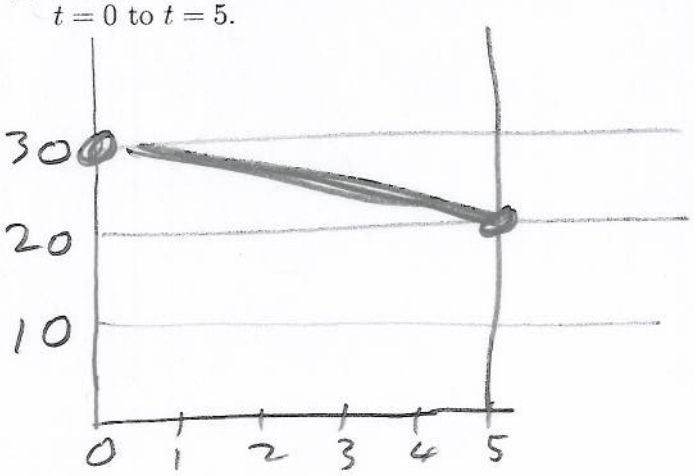
$= \frac{1}{20} \int_0^{20} v(t)\,dt$

Average speed = 130.61

$= (1/20)\,\text{fnInt}(120(1 - .8\hat{}X), X, 0, 20)$

(11) (10 points) A bike rider is riding at a speed of 30 ft/sec. She comes to a hill and her speed, v, decreases to 20 ft/sec at a constant rate (that is constant negative acceleration) over a 5 second period.

(a) Graph v as a function of t the time in seconds since she started up the hill for t form $t = 0$ to $t = 5$.



(b) How far did she travel during this 5 second period?

Distance traveled 125 ft.

Distance traveled = Area under velocity curve

= Area ( )

= Area ( ) + Area ( )

$= \frac{1}{2}(5)(10) + 20 \cdot 5$

$= 25 + 100 = 125$