Name:____________________________________ Date:____________

AP Calc AB Ms. Loughran

Do Now

1. A solution of the equation $\frac{dy}{dx} + 2xy = 0$ that contains the point $(0, e)$ is

(A) $y = e^{1-x^2}$

(B) $y = e^{1+x^2}$

(C) $y = e^{1-x}$

(D) $y = e^{1+x}$

(E) $y = e^{x^2}$

$$\frac{dy}{dx} = -2xy$$
$$\int \frac{dy}{y} = \int -2x\,dx$$
$$\ln|y| = -x^2 + C \qquad (0, e)$$
$$\ln e = C$$
$$1 = C$$
$$e^{\ln|y|} = e^{-x^2+1}$$
$$|y| = e^{-x^2+1}$$
$$y = \cancel{\pm} e^{1-x^2}$$

2. If $\frac{dy}{dx} = \frac{x}{y}$ and $y = -1$ when $x = 1$, find y when $x = 4$.

$$\int y\,dy = \int x\,dx$$
$$\frac{y^2}{2} = \frac{x^2}{2} + C \qquad (1, -1)$$
$$\frac{(-1)^2}{2} = \frac{1^2}{2} + C$$
$$0 = C$$
$$\frac{y^2}{2} = \frac{x^2}{2} \rightarrow y^2 = x^2 \quad (1,-1)$$
$$y = \cancel{\pm} x$$
$$\frac{y^2}{2} = \frac{4^2}{2} \rightarrow$$
$$y^2 = 16$$
$$y = \cancel{\pm} 4$$
$$y = -4$$

$\frac{8-0}{4}=2$

3. The table below shows the values of R(t), a differentiable function of t.

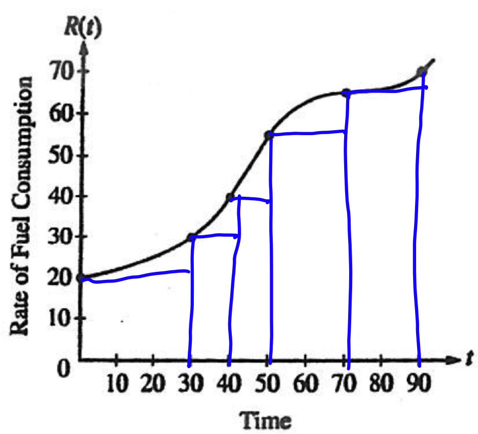
t	0	1	2	3	4	5	6	7	8
R(t)	4.6	5.4	6.1	6.5	6.8	6.3	6.0	5.5	4.8

(a) Use a midpoint Riemann sum with four equal subintervals of equal length to approximate $\int_0^8 R(t)dt$.

$2(5.4)+2(6.5)+2(6.3)+2(5.5)$

(b) Use a trapezoidal approximation with four equal subintervals of equal length to approximate $\int_0^8 R(t)dt$.

$\cancel{\frac{1}{2}}(\cancel{2})(4.6+2(6.1)+2(6.8)+2(6)+4.8)$



t (minutes)	$R(t)$ (gallons per minute)
0	20
30	30
40	40
50	55
70	65
90	70

4. The rate of fuel consumption, in gallons per minute, recorded during an airplane flight is given by a twice-differentiable and strictly increasing function R of time t. The graph of R and a table of selected values of $R(t)$, for the time interval $0 \le t \le 90$ minutes, are shown above. Approximate the value of $\int_0^{90} R(t)dt$ using a left Riemann sum with five subintervals indicated by the data in the table. Is this numerical approximation less than the value of $\int_0^{90} R(t)dt$? Explain.

$(30)(20)+(10)(30)+(10)(40)+(20)(55)+(20)(65)$

Yes it is an underapproximation of $\int_0^{90} R(t)dt$ bc of the diagram drawn

5. The temperature, in degrees Celsius, of the water in a pond is a differentiable function W of time t. The table below shows the water temperature as recorded every 3 days over a 15-day period. Approximate $\int_0^{15} W(t)dt$ by using the trapezoidal approximation with subintervals of length $\Delta t = 3$.

t (days)	$W(t)$ (°C)
0	20
3	31
6	28
9	24
12	22
15	21

$\frac{1}{2}(3)\left(20 + 2(31) + 2(28) + 2(24) + 2(22) + 21\right)$

or

$\frac{1}{2}(3)(20+31) + \frac{1}{2}(3)(31+28) + \ldots$

6. A metal wire of length 8 centimeters is heated at one end. The table below gives selected values of the temperature $T(x)$, in degrees Celsius, of the wire x cm from the heated end. The function T is decreasing and twice differentiable. Estimate $\int_0^8 T(x)dx$ using four subintervals and the (a) trapezoidal rule (b) a left hand Riemann sum.

Dist. x (cm)	0	1	5	6	8
Temp. $T(x)$ (°C0	100	93	70	62	55

(a) $\frac{1}{2}\left[1(100+93) + 4(93+70) + 1(70+62) + 2(62+55)\right]$

(b) $1(100) + 4(93) + 1(70) + 2(62)$

Homework 02-29

Name: ______________________________

AP Calculus Homework

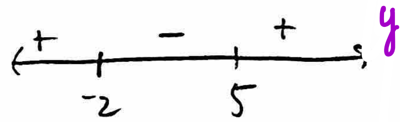
Date: __________

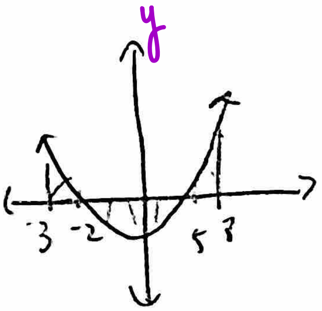
Ms. Loughran

$0 = (x-5)(x+2)$

$x = 5, -2$

1. Find the total area bounded by the x-axis and the curve $y = x^2 - 3x - 10$ from $x = -3$ and $x = 8$.

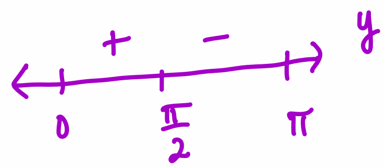


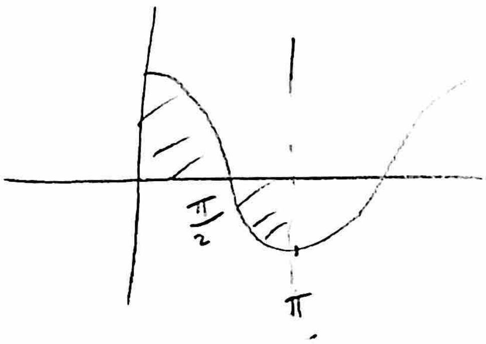


$$\int_{-3}^{-2} (x^2 - 3x - 10)\,dx + \int_{5}^{-2} (x^2 - 3x - 10)\,dx + \int_{5}^{8} (x^2 - 3x - 10)\,dx =$$

101.5

2. Find the area under the curve $y = \cos x$ over the interval $\left[0, \cancel{\frac{\pi}{2}}\right]$ π.





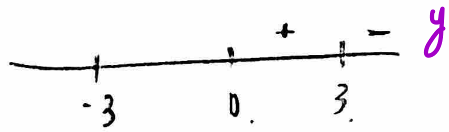
$$\int_{0}^{\frac{\pi}{2}} \cos x\,dx + \int_{\pi}^{\frac{\pi}{2}} \cos x\,dx$$

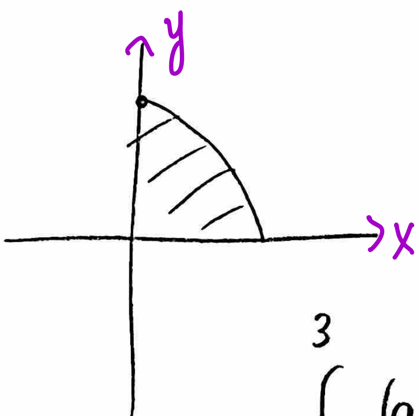
$$+\sin x \Big|_{0}^{\pi/2} + \;+\sin x \Big|_{\pi}^{\pi/2}$$

$$\underset{1-0}{\sin(\pi/2) - \sin(0)} + \underset{[1-0]}{\left[\sin \pi/2 - \sin \pi\right]} = 2$$

3. Find the total area bounded by the x-axis and the curve $y = 9 - x^2$ from $x = 0$ and $x = 3$.

$y = (3-x)(3+x)$





$$\int_{0}^{3} (9 - x^2)\,dx = 9x - \frac{x^3}{3}\Big|_{0}^{3}$$

$$9(3) - \frac{3^3}{3} - 0 = 27 - 9 = 18$$