Name: ______________________________________ Date: ___________

AP Calculus AB Ms. Loughran

Do Now:

1. If $f(0)=3$ and $f(x)=\sqrt{9+\sin(2x)}$, then estimate the value of $f(0.06)$ using local linearization.

2. $\int\left(1-\cos^2 x\sec x\right)dx =$

3. $\int((x^2+2)(1-x))dx =$

$\left.\begin{matrix}\\ \\ \end{matrix}\right\}$ we did in open review on Wednesday

① $f'(x) = \frac{1}{\cancel{2}}(9+\sin(2x))^{-\frac{1}{2}} \cdot \cancel{2}\cos 2x$

$f'(0) = (9+\sin 0)^{-\frac{1}{2}} \cdot \cos 0$

$9^{-\frac{1}{2}} \cdot 1 = \frac{1}{3}$

$y-3 = \frac{1}{3}x$

$y = \frac{1}{3}x + 3$

$y = \frac{1}{\cancel{3}}(\overset{.02}{\cancel{.06}}) + 3 \quad = 3.02$

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Fundamental Theorem of Calculus Part I:

If a function f is continuous on an interval $[a,b]$, then it follows that

F'(x) dx

$$\int_a^b f(x)dx = F(b) - F(a)$$ where F is a function such that $F'(x)=f(x)$

(F is any antiderivative of f).

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AP Calculus AB   Evaluating Definite Integrals   Ms. Loughran

Part A. Directions: Answer these questions *without* using your calculator.

1. $\int_{-1}^{1} (x^2 - x - 1)\, dx =$

(A) $\frac{2}{3}$ (B) 0 (C) $-\frac{4}{3}$ (D) -2 (E) -1

$$\left.\frac{x^3}{3} - \frac{x^2}{2} - x\right|_{-1}^{1}$$

$$\frac{1^3}{3} - \frac{1^2}{2} - 1 - \left(\frac{(-1)^3}{3} - \frac{(-1)^2}{2} - (-1)\right)$$

$$\frac{1}{3} - \frac{1}{2} - 1 - \left(\frac{-1}{3} - \frac{1}{2} + 1\right)$$

$$\frac{1}{3} - \cancel{\frac{1}{2}} - 1 + \frac{1}{3} + \cancel{\frac{1}{2}} - 1 = \frac{2}{3} - 2 = -\frac{4}{3}$$

2. $\int_{1}^{2} \frac{3x-1}{3x}\, dx =$

(A) $\frac{3}{4}$ (B) $1 - \frac{1}{3}\ln 2$ (C) $1 - \ln 2$ (D) $-\frac{1}{3}\ln 2$ (E) 1

$$\int_1^2 \left(1 - \frac{1}{3}x^{-1}\right)dx$$

$$\left.x - \frac{1}{3}\ln|x|\right|_1^2$$

$$2 - \frac{1}{3}\ln|2| - \left(1 - \frac{1}{3}\ln|1|\right)$$

$$2 - \frac{1}{3}\ln 2 - 1 + \frac{1}{3}\ln 1$$

$$2 - \frac{1}{3}\ln 2 - 1 + 0$$

$$1 - \frac{1}{3}\ln 2$$

3. $\int_0^3 \frac{dt}{\sqrt{4-t}} =$

(A) 1 (B) −2 (C) 4 (D) −1 (E) 2

$u = 4-t$

$du = -dt$

$-du = dt$

$$-\int_{4-0}^{4-3} u^{-\frac{1}{2}}\,du$$

$$-\int_4^1 u^{-\frac{1}{2}}\,du = -2u^{\frac{1}{2}}\Big|_4^1 = -2(1)^{\frac{1}{2}} - \left(-2(4)^{\frac{1}{2}}\right)$$

$$= -2 - (-4)$$

4. $\int_{-1}^{0} \sqrt{3u+4}\,du =$

(A) 2 (B) $\frac{14}{9}$ (C) $\frac{14}{3}$ (D) 6 (E) $\frac{7}{2}$

$y = 3u+4$

$dy = 3\,du$

$\frac{dy}{3} = du$

$$\frac{1}{3}\int_{3(-1)+4}^{3(0)+4} y^{\frac{1}{2}}\,dy = \frac{1}{3}\int_1^4 y^{\frac{1}{2}}\,dy = \frac{1}{3}\cdot\frac{2}{3}y^{3/2}\Big|_1^4$$

$$\frac{2}{9}y^{3/2}\Big|_1^4$$

$$\frac{2}{9}\left(4^{3/2} - 1^{3/2}\right) = \frac{2}{9}(8-1) = \frac{14}{9}$$

5. $\int_2^3 \frac{dy}{2y-3} =$

(A) $\ln 3$ (B) $\frac{1}{2}\ln\frac{3}{2}$ (C) $\frac{16}{9}$ (D) $\ln\sqrt{3}$ (E) $\sqrt{3}-1$

$u = 2y-3$

$du = 2dy$

$\frac{du}{2} = dy$

$$\frac{1}{2}\int_{2(2)-3}^{2(3)-3} \frac{1}{u}\,du$$

$$\frac{1}{2}\int_{1}^{3} \frac{1}{u}\,du = \frac{1}{2}\ln|u|\Big|_1^3$$

$$\frac{1}{2}(\ln 3 - \overset{0}{\ln 1}) = \frac{1}{2}\ln 3$$

$\ln 3^{\frac{1}{2}}$

$\ln\sqrt{3}$

6. $\int_0^{\sqrt{3}} \frac{x}{\sqrt{4-x^2}}\,dx =$

(A) 1 (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{3}$ (D) -1 (E) 2

$u = 4-x^2$

$du = -2x\,dx$

$-\frac{du}{2} = x\,dx$

$$-\frac{1}{2}\int_{4-0^2}^{4-(\sqrt{3})^2} u^{-\frac{1}{2}}\,du$$

$$-\frac{1}{2}\int_4^1 u^{-\frac{1}{2}}du = -\frac{1}{\cancel{2}}\,\cancel{2}u^{\frac{1}{2}}\Big|_4^1$$

$-u^{\frac{1}{2}}\Big|_4^1$ $\quad -1^{\frac{1}{2}} - (-4^{\frac{1}{2}})$

$-1+2$