HIGH SCHOOL ROUND ONE

8ÖÜ ÞÐÓÓ ÏÈÝÌ **two minutes** ÛÖ ÌÝÈÓÜÈÛÌ ÌÈÊÏ Ö® א ¾jM ÔÐÕÜÛÌÚ

INTEGRAL #1

READY,

GET SET,...

2:00

INTEGRAL #1

$$\int_0^4 \left(3x^2 + 3\sqrt{x}\right)\, dx$$

2:00

INTEGRAL #1

$$\int_0^4 \left(3x^2 + 3\sqrt{x}\right)\, dx$$

$$= \int_0^4 \left(3x^2 + 3x^{1/2}\right)\, dx$$

$$= \left[x^3 + 2x^{3/2}\right]_0^4$$

$$= \boxed{80}$$

INTEGRAL #2

READY,

GET SET,...

2:00

2:00

INTEGRAL #2

$$\int_0^{\pi/3} \text{ÚÐÕ}\,\frac{x}{2}\,dx$$

$$= 2\int_0^{\pi/6} \text{ÚÐÕ}\,u\,du \qquad \left[u = \frac{x}{2}, \quad du = \frac{1}{2}\,dx\right]$$

$$= \Big[-2\,\text{ÊÖÚ}\,u\Big]_0^{\pi/6}$$

$$= \boxed{2 - \sqrt{3}}$$

INTEGRAL #3

READY,

GET SET,...

2:00

INTEGRAL #3

$$\int_1^3 \frac{x^2+3}{x^2}\,dx$$

2:00

INTEGRAL #3

$$\int_1^3 \frac{x^2+3}{x^2}\,dx$$

$$= \int_1^3 \left(\frac{x^2}{x^2} + \frac{3}{x^2}\right)\,dx$$

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

$$= \left[x - \frac{3}{x}\right]_1^3 = \boxed{4}$$

INTE [redacted] # 4

READY,

GET SET,...

2:00

INTEGRAL #4

$$\int_1^4 e\sqrt{x}$$

2:00

INTEGRAL #5

READY,

GET SET,...

2:00

2:00

INTEGRAL #5

$$\int_{-2}^{-1} x\sqrt{x+2}\,dx$$

$$= \int_0^1 (u-2)\sqrt{u}\,du \quad [\,u = x+2, \quad du = dx, \quad x = u-2\,]$$

$$= \int_0^1 \left(u^{3/2} - 2u^{1/2}\right) du$$

$$= \left[\frac{2u^{5/2}}{5} - \frac{4u^{3/2}}{3}\right]_0^1 = \boxed{-\frac{14}{15}}$$

INTEGRAL #6

READY,

GET SET,...

2:00

INTEGRAL #6

$$\int_0^{\sqrt{\pi}/2} x \cos\left(x^2\right) dx$$

2:00

INTEGRAL #6

$$\int_0^{\sqrt{\pi}/2} x\,\text{ÚÌÊ}^2\left(x^2\right)\,\text{ÛÈÕ}^2\left(x^2\right)\,dx$$

$$= \frac{1}{2}\int_0^1 u^2\,du \quad \left[\,u = \text{ÛÈÕ}\left(x^2\right), \quad du = 2x\,\text{ÚÌÊ}^2\left(x^2\right)\,dx\,\right]$$

$$= \left[\frac{u^3}{6}\right]_0^1$$

$$= \boxed{\frac{1}{6}}$$

INTEGRAL #7

READY,

GET SET,...

2:00

INTEGRAL #7

$$\int_2^4 \frac{1}{x^2}\left(2-\frac{4}{x}\right)^4 dx$$

2:00

INTEGRAL #7

$$\int_2^4 \frac{1}{x^2}\left(2-\frac{4}{x}\right)^4 dx$$

$$= \frac{1}{4}\int_0^1 u^4\, du \qquad \left[u = 2-\frac{4}{x}, \quad du = \frac{4}{x^2}\right]$$

$$= \left[\frac{u^5}{20}\right]_0^1$$

$$= \boxed{\frac{1}{20}}$$

INTEGRAL #8

READY,

GET SET,...

2:00

INTEGRAL #8

$$\int_0^{\pi/2} x \text{ ÚÐÕ } x \, dx$$

2:00

INTEGRAL #8

$$\int_0^{\pi/2} x\,\text{ÚÐÕ}\,x\,dx$$

$$\left[\text{ÐÕÛÌÎÙÈÛÌ É à}\times\text{ÈÙÛÚö}\quad \begin{matrix} u = x \\ du = dx \end{matrix}\,,\quad \begin{matrix} dv = \text{ÚÐÕ}\,x\,dx \\ v = -\text{ÊÖÚ}\,x \end{matrix}\right]$$

$$= \Big[-x\,\text{ÊÖÚ}\,x\Big]_0^{\pi/2} + \int_0^{\pi/2} \text{ÊÖÚ}\,x\,dx$$

$$= \Big[-x\,\text{ÊÖÚ}\,x + \text{ÚÐÕ}\,x\Big]_0^{\pi/2} = \boxed{1}$$

INTEGRAL #9

READY,

GET SET,...

2:00

INTEGRAL #9

$$\int_{5.5}^{6.0} (2x - 11)^{99}\, dx$$

2:00

INTEGRAL #9

$$\int_{5.5}^{6.0} (2x - 11)^{99}\, dx$$

$$= \frac{1}{2}\int_{0}^{1} u^{99}\, du \quad \left[\, u = 2x - 11, \quad du = 2\, dx \,\right]$$

$$= \left[\frac{u^{100}}{200}\right]_{0}^{1}$$

$$= \boxed{}$$

2:00

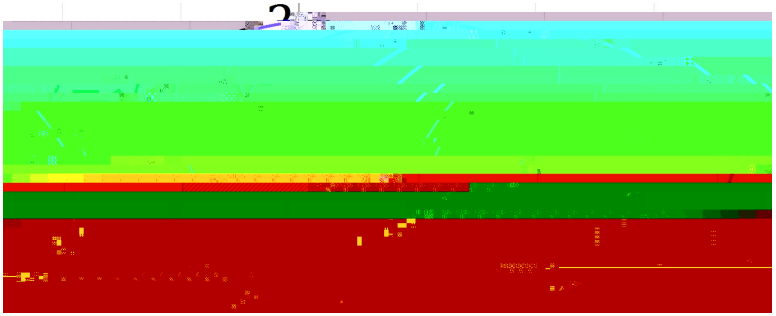
INTEGRAL #10

$$\int_0^2 \sqrt{4 - x^2}\, dx$$

ÛÏÌ ÈÙÌÈ ÖÍ ÛÏÐÚ

á ØÜÈÙÛÌÙıÊÐÙÊÓÌ

ÞÐÛÏ ÙÈËÐÜÚ 2



$$= \frac{1}{4} \cdot \pi \cdot 2^2$$

$$= \boxed{\pi}$$

INTEGRAL #11

READY,

GET SET,...

2:00

INTEGRAL #11

$$\int_{\pi/3}^{\pi/2} \frac{\text{ÚÐÕ}\, 2x}{\text{ÚÐÕ}\, x}\, dx$$

2:00

INTEGRAL #11

$$\int_{\pi/3}^{\pi/2} \frac{\text{ÚÐÕ}\, 2x}{\text{ÚÐÕ}\, x}\, dx$$

$$= \int_{\pi/3}^{\pi/2} \frac{2\,\text{ÚÐÕ}\, x\,\text{ÊÖÚ}\, x}{\text{ÚÐÕ}\, x}\, dx$$

$$= \int_{\pi/3}^{\pi/2} 2\,\text{ÊÖÚ}\, x\, dx$$

$$= \left[2\,\text{ÚÐÕ}\, x\right]_{\pi/3}^{\pi/2} = 2 -$$

INTEGRAL #12

$$\int_0^1 \left(x^3+4\right)^2 dx$$

2:00

INTEGRAL #12

$$\int_0^1 \left(x^3 + 4\right)^2 dx$$

$$= \int_0^1 \left(x^6\right.$$

INTEGRAL #13

READY,

GET SET,...

2:00

INTEGRAL #13

$$\int_0^{\pi} \left(e^x + \text{ÚÐÕ}\, x\right)\left(e^x + \text{ÊÖÚ}\, x\right) dx$$

2:00

INTEGRAL #14

READY,

GET SET,...

2:00

2 0 1!

INTEGRAL #14

$$\int_0^1 \sqrt[3]{x} \cdot \sqrt[6]{x} \cdot \sqrt[9]{x}\, dx$$

2:00

INTEGRAL #14

$$\int_0^1 \sqrt[3]{x} \cdot \sqrt[6]{x} \cdot \sqrt[9]{x}\, dx$$

$$= \int_0^1 x^{1/3+1/6+1/9}\, dx$$

$$= \int_0^1 x^{11/18}\, dx$$

$$= \left[\frac{18x^{29/18}}{29}\right]_0^1 = \boxed{\frac{18}{29}}$$

INTEGRAL #15

READY,

GET SET,...

2:00

INTEGRAL #15

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

2:00

INTEGRAL #15

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

$$= \int_0^1 \frac{\sqrt{x}}{\left(x\sqrt{x}+1\right)^2}\,dx$$

$$= \frac{2}{3}\int_1^2 \frac{1}{u^2}\,du \qquad \left[u = x\sqrt{x}+1, \quad du = \frac{3}{2}\sqrt{x}\,dx\right]$$

$$= \left[-\frac{2}{3u}\right]_1^2 = \boxed{\frac{1}{3}}$$

THANKS FOR PLAYING

LET'S EAT!

(YOU HAVE TWO MINUTES TO FINISH YOUR FOOD)

THE FINAL ROUND BEGINS AFTER DINNER