

HIGH SCHOOL ROUND ONE



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INTEGRAL #1

**READY,
GET SET,...**

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INTEGRAL #1

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

INTEGRAL #1

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

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

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

$$= 80$$

INTEGRAL #2

**READY,
GET SET,...**

2:00



INTEGRAL #2

$$\int_0^{\pi/3} \sqrt{1 - \frac{x}{2}} dx$$

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

$$= \left[-2 \sqrt{1 - u} \right]_0^{\pi/6}$$

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

INTEGRAL #3

**READY,
GET SET,...**

2:00

INTEGRAL #3

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

INTEGRAL #2

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

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

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

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

INT #4

**READY,
GET SET,...**

2:00

INTEGRAL #4

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

INTEGRAL #5

**READY,
GET SET,...**

2:00



INTEGRAL #5

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

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

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

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

INTEGRAL #6

**READY,
GET SET,...**

2:00

INTEGRAL #6

$$\int_0^{\sqrt{\pi}/2} x \Gamma\left(\frac{1}{2}\right)^2 (x^2)^{\frac{2}{\alpha} \pm} dx$$

INTEGRAL #6

$$\int_0^{\sqrt{\pi}/2} x \sin^2(x^2) \cdot \cos^2(x^2) dx$$

$$= \frac{1}{2} \int_0^1 u^2 du \quad [u = \sin^2(x^2), \quad du = 2x \sin^2(x^2) dx]$$

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

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

INTEGRAL #7

**READY,
GET SET,...**

2:00

INTEGRAL #7

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

INTEGRAL #7

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

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

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

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

INTEGRAL #8

**READY,
GET SET,...**

2:00

INTEGRAL #8

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

INTEGRAL #8

$$\int_0^{\pi/2} x \sqrt[3]{1-x} dx$$

$$\left[\begin{array}{l} u = x \\ du = dx \end{array} , \quad \begin{array}{l} dv = \sqrt[3]{1-x} dx \\ v = -\frac{3}{2} \sqrt[3]{1-x} \end{array} \right]$$

$$= \left[-x \sqrt[3]{1-x} \right]_0^{\pi/2} + \int_0^{\pi/2} \sqrt[3]{1-x} dx$$

$$= \left[-x \sqrt[3]{1-x} + \sqrt[3]{1-x} \right]_0^{\pi/2} = \boxed{1}$$

INTEGRAL #9

**READY,
GET SET,...**

2:00

INTEGRAL #9

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

INTEGRAL #9

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

$$= \frac{1}{2} \int_0^1 u^{99} du \quad [u = 2x - 11, \quad du = 2 dx]$$

$$= \left[\frac{u^{100}}{200} \right]_0^1$$

$$= \left[\right]$$



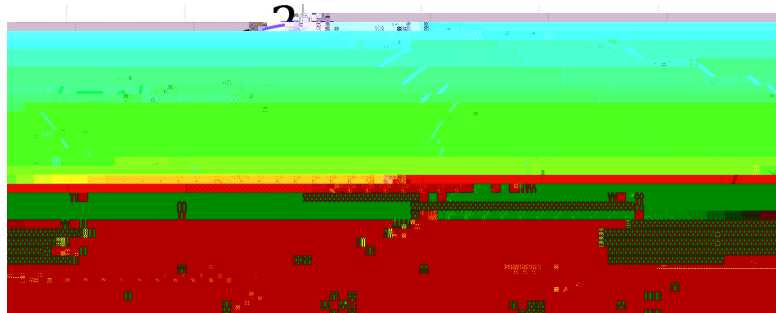
INTEGRAL #10

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

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

$$= \pi$$

INTEGRAL #11

**READY,
GET SET,...**

2:00

INTEGRAL #11

$$\int_{\pi/3}^{\pi/2} \frac{\sqrt{1 \pm 2x}}{\sqrt{1 \pm x}} dx$$

INTEGRAL #11

$$\int_{\pi/3}^{\pi/2} \frac{\cos 2x}{\cos x} dx$$

$$= \int_{\pi/3}^{\pi/2} \frac{2 \cos^2 x - \cos x}{\cos x} dx$$

$$= \int_{\pi/3}^{\pi/2} (2 \cos x - 1) dx$$

$$= \left[2 \sin x - x \right]_{\pi/3}^{\pi/2} = 2 - \frac{\pi}{3}$$



INTEGRAL #12

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

INTEGRAL #12

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

$$= \int_0^1 (x^6$$

INTEGRAL #13

**READY,
GET SET,...**

2:00

INTEGRAL #13

$$\int_0^{\pi} (e^x + \sin x) (e^x + \sin^2 x) dx$$



INTEGRAL #14

**READY,
GET SET,...**

2:00

INTEGRAL #14

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

INTEGRAL #14

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

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

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

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

INTEGRAL #15

**READY,
GET SET,...**

2:00

INTEGRAL #15

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

INTEGRAL #15

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

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

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

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

THANKS FOR PLAYING

LET'S EAT!

(YOU HAVE TWO MINUTES TO FINISH YOUR FOOD)

THE FINAL ROUND BEGINS AFTER DINNER