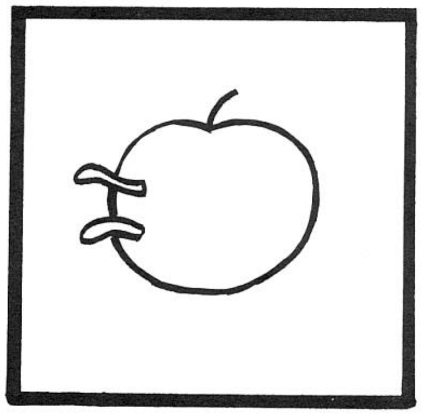
Droodle for Calculus A.P. Exam

A Puzzle by David Pleacher

Can you name this droodle?



Back in 1953, Roger Price invented a minor art form called the Droodle, which he described as "a borkley-looking sort of drawing that doesn't make any sense until you know the correct title." The droodle above was drawn by Roger Price and published in his book called, *Droodles*.

To determine the title to this droodle, you must first solve the problems in the puzzle and find the corresponding answers. Then replace each numbered blank in the puzzle with the letter corresponding to the answer for that problem and that will give you the title.

Title:

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__ __ __ __     __ __ __ __ __ __     __ __ __ __     __ __
14 18  6 22     10  7  5  4 21 15     20  3  9 17     12  2

__ __ __ __ __ __ .
11 16  8 19 13  1
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Here are the choices for your answers:

A. -12

A. -10

A. $\frac{-4}{9}$

B. $\frac{-11}{4}$

C. $\frac{4}{9}$

D. $\frac{1}{4}$

D. $\frac{6}{5}$

E. $e-1$

E. $\frac{11}{6}$

F. $e+1$

G. 2

H. $\frac{128\pi}{3}$

I. 3.5

I. $\frac{32}{9}$

K. 4

L. $\frac{40}{9}$

M. $\frac{5}{\sqrt{3}}$

M. 6

N. 9

N. 13

N. 27

N. 128π

N. $\frac{12\sqrt{3}-12}{\pi}$

O. $\frac{12-4\sqrt{3}}{\pi}$

O. (5, 15)

P. (5, -48)

Q. $\frac{\sin 2x}{2}$

R. $\frac{\sin 2x-1}{2}$

R. $\frac{15x^2+4x}{2\sqrt{3x+1}}$

S. $\frac{-9x^2+4x}{2\sqrt{3x+1}}$

S. $8\sec^4 4x$

T. $8\tan 4x\sec^2 4x$

T. $y-\frac{1}{2}=x-\frac{\pi}{4}$

T. -6 < x < 2

U. $y-\frac{1}{2}=\frac{1}{2}\left(x-\frac{\pi}{4}\right)$

V. x > 2

V. $-3\cot 3x$

W. $-3\tan 3x$

Y. None of the above

A calculator may NOT be used on these questions.

__ 1. $\int_{\frac{\pi}{4}}^{x} \cos 2t\, dt =$

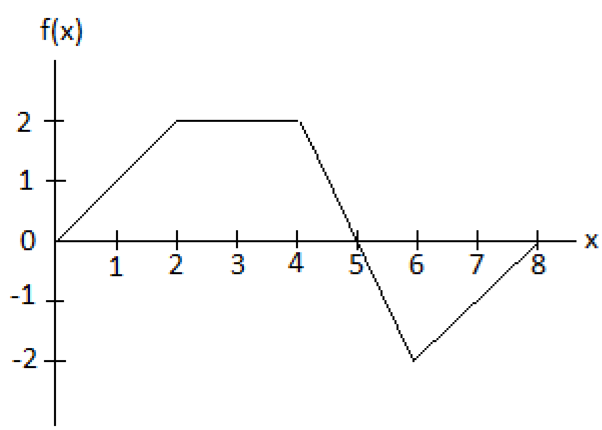
__ 2. Determine the coordinates of the point of inflection on the graph of $y = x^3 - 15x^2 + 33x + 100$.

__ 3. If $3x^2 - 2xy + 3y = 1$, then when x = 2, $\frac{dy}{dx} =$

__ 4. $\int_{1}^{3} \frac{8}{x^3}\, dx =$

__ 5. The graph of a piecewise linear function f, for $0 \le x \le 8$, is shown below.

What is the value of $\int_{0}^{8} f(x)\, dx$?



__ 6. If $f(x)=x^2\sqrt{3x+1}$, then $f'(x)=$

__ 7. What is the instantaneous rate of change at t = -1 of the function f,

if $f(t)=\dfrac{t^3+t}{4t+1}$?

__ 8. $\displaystyle\int_2^{e+1}\left(\frac{13}{x-1}\right)dx=$

__ 9. $\dfrac{d}{dx}\left(\tan^2 4x\right)=$

__10. Determine the equation of the line tangent to the graph of

$y=\sin^2 x$ at $\dfrac{\pi}{4}$?

__ 11. If the function $f(x)=\begin{cases}3ax^2+2bx+1; & x\le 1\\ ax^4-4bx^2-3x; & x>1\end{cases}$ is differentiable for all real

values of x, then b =

__ 12. On what interval is the graph of $y = x^4 + 8x^3 - 72x^2 + 4$ concave down?

__ 13. If $f(x)=\dfrac{x^2+5x-24}{x^2+10x+16}$, then $\displaystyle\lim_{x\to -8} f(x)=$

__ 14. If $f(x) = \ln\left(cos\left(3x\right)\right)$, then $f'(x) =$

__ 15. If $f(x) = \int_0^{x+1} \sqrt[3]{t^2 - 1}\, dt$, then $f'(-4) =$

__ 16. A particle moves along the x-axis so that its position at time t, in seconds, is given by $x(t) = t^2 - 7t + 6$. For what value(s) of t is the velocity of the particle zero?

__ 17. $\int_0^{\frac{\pi}{2}} \sin\left(2x\right)e^{\sin^2 x}dx =$

__ 18. The average value of $\sec^2 x$ on the interval $\left[\frac{\pi}{6}, \frac{\pi}{4}\right]$ is

__ 19. Determine the area of the region bounded by the parabolas $y = x^2$ and $y = 6x - x^2$.

__ 20. $\lim\limits_{x \to 0} \frac{\tan(3x) + 3x}{\sin(5x)} =$

__ 21. If the region enclosed by the y-axis, the curve $y = 4\sqrt{x}$, and the line $y = 8$ Is revolved about the x-axis, determine the volume of the solid generated.

__ 22. Determine the value of c that satisfies the Mean Value Theorem for derivatives on the interval [0, 5] for the function $f(x) = x^3 - 6x$.