1. Please cross $\boxed{\times}$ the correct answers.

2. This test will be exactly 120 minutes in length. When you are told to begin, but not before, glance through the entire test and put your name on each page. It is YOUR RESPONSIBILITY to make sure your test consists of 13 PAGES with 25 PROBLEMS. Each problem has an equal point value of 6 points. Use the back of the test pages for scratch work.

Sign your name:

16 =1.3in =0.55cm =1cm=0.5cm

Let $f(x) = x^3 + 4x - 3$, $x \geq 0$. Find the value of $\frac{d}{dx} f^{-1}$ at the point $x = 2 = f(1)$.

$\frac{1}{7}$ $\frac{1}{16}$ 7 16 $\frac{1}{2}$

$\frac{d}{dt}(\sqrt{t})^t =$

$\frac{(\sqrt{t})^t(1+\ln t)}{2}$ $\frac{1+\ln t}{2}$ $(\sqrt{t})^{(t-1)}$ $\frac{(\sqrt{t})^{(t-2)}}{2}$ $t(\sqrt{t})^{(t-1)}$

Assume that a colony of bacteria is grown under ideal conditions, and has its population increase exponentially with time. At the end of one hour there are 10,000 bacteria. At the end of three hours there are 40,000 bacteria. How many of bacteria were present initially.

5,000 2,500 $\frac{10,000}{\ln 3}$ $\frac{5,000}{\ln 3}$ $\frac{10,000 \ln 3}{\ln 4}$

$\lim_{x\to\infty} \left(1 + \frac{3}{x}\right)^x =$

e^3 1 ∞ 4 20

Which of the functions

1) 2^x 2) $\frac{x^2}{10000}$ 3) $10000 \ln x$ 4) $\sqrt{x}$ 5) e^x

is the slowest growing as $x \to \infty$.

$10000 \ln x$ 2^x $\frac{x^2}{10000}$ $\sqrt{x}$ e^x

Simplify the expression $\log_{11} 121$

2 e^2 11 1 e^{11}

$\int \frac{e^{\arcsin(x)}}{\sqrt{1-x^2}} \mathrm{d}x =$

$e^{\arcsin(x)}+C$ $e^{\sqrt{1-x^2}}+C$ $e^{\sqrt{1-x^2}}+C$ $\operatorname{arcsec}(e^x)+C$ $\frac{e^{\arcsin(x)}}{\sqrt{1-x^2}}+C$

Solve $\frac{dy}{dx} = 2(x + y^2 x)$.

$\tan(x^2+C)$ $\frac{x^2}{\arctan(x+C)}$ $\sin(x^2+C)$ $\sinh(x^2+C)$ e^{x^2+C} $\arctan(x)$

If $a_1 = 2$ and $a_{n+1} = (-1)^{n+1}\frac{a_n}{2}$ then $a_3 = ?$

$-\left(\frac{1}{2}\right)$ $\frac{1}{4}$ $\frac{1}{2}$ $-\left(\frac{1}{4}\right)$ $\frac{1}{8}$

Find $\lim_{n\to\infty} \left(\frac{3}{n}\right)^{\frac{1}{n}}$

1 0 3 e^2 $\frac{-1}{3}$

Evaluate $\int\limits_e^{+\infty} \frac{1}{x(\ln(x))^2} dx$

1 $\frac{\pi}{2}$ $\frac{1}{3}$ $\frac{1}{2}$ e^2

Evaluate $\int \frac{dx}{x^2+x}$

$\ln|x| - \ln|x+1| + C$ $\ln|x| + \ln|x+1| + C$ $\ln|x^2+x| + C$ $\ln(x^2) + \ln|x| + C$ $-\left(\frac{1}{x}\right) + \ln|x| + C$

Evaluate $\int \frac{dx}{x^2+4}$

$\frac{1}{2}\arctan\left(\frac{x}{2}\right) + C$ $\arctan\left(\frac{x}{2}\right) + C$ $-\left(\frac{1}{x}\right) + 4 + C$ $\arccos\left(\frac{x}{2}\right) + C$ $\ln(4+x^2) + C$

Evaluate $\int x^2 \sin(x) dx$

$-x^2\cos(x) + 2x\sin(x) + 2\cos(x) + C$ $x^2\cos(x) - 2x\cos(x) - 2\cos(x) + C$ $-x^2\cos(x) + 2\cos(x) + C$ $2x\sin(x) + x^2\cos(x) - 2\sin(x) + C$ $-x^2\sin(x) - 2x\cos(x) + 2\sin(x) + C$

Find the sum of the series $\sum\limits_{n=2}^{\infty} 5\left(\frac{1}{2}\right)^n$

$\frac{5}{2}$ $\frac{5}{4}$ 5 10 15

Which of the following series converge: (1) $\sum\limits_{n=1}^{\infty} \frac{(n+1)!}{3!\ n!\ 3^n}$, (2) $\sum\limits_{n=0}^{\infty} \left(\frac{1}{2}\right)^n$, (3) $\sum\limits_{n=2}^{\infty} \frac{1}{2n-1}$

(1) and (2) (1) and (3) (2) and (3) (1) (2)

Find the length of the curve:

$$(x(t), y(t)) = \left(3t^2, 3t - t^3\right),\ 0 \le t \le 1.$$

4 5 7 15 6

For what values of x does the series $\sum_{n=0}^{\infty}(25x^2)^n$ converge absolutely.

$|x| < \frac{1}{5}$ $|x| < 1$ $|x| < 5$ $|x| < 2$ $|x| < \frac{1}{25}$

The coefficient of the degree 6 term of the Maclaurin series for $x^2\cos(x^2)$ is:

$-\frac{1}{2}$ $\frac{1}{2}$ 0 $\frac{1}{6!}$ $-\frac{1}{6!}$

Find the area of the surface generated by revolving the circle $(x(t), y(t)) = (\cos(t), 7 + \sin(t)),\ 0 \le t \le 2\pi$, around the x-axis.

$28\pi^2$ $20\pi^2$ $7\pi^2$ π^2 $49\pi^2$

Compute the Eccentricity of the Ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$

$\frac{\sqrt{7}}{4}$ 5 $\frac{5}{4}$ $\frac{\sqrt{7}}{3}$ $\frac{5}{3}$

Consider the curve $(x(t), y(t)) = \left(\sqrt{t^2+3}, t^3\right)$. Let P be the point $(x(1), y(1))$. The tangent line to the curve at P has then the equation:

$y = 6x - 11$ $y = 3x - 10$ $y = -3x - 8$ $y = 3x - 13$ $y = 6x - 25$

Find the second order Taylor polynomial for $f(x) = e^x$ at $a = 1$.

$e + e\,(x-1) + \frac{e}{2}\,(x-1)^2$ $\frac{5}{2} + 2\,(x-1) + \frac{1}{2}\,(x-1)^2$ $\frac{5e}{2} + 2\,e\,(x-1) + \frac{e}{2}\,(x-1)^2$ $\frac{7e}{3} + \frac{5e}{3}\,(x-1) + \frac{e}{3}\,(x-1)^2$ $ex^2 + ex + 1$

The polar equation $r = -8\cos(\theta)$, where $r \ge 0$ and $0 \le \theta \le 2\pi$, is the same as the cartesian equation:

$x^2 + 8x + y^2 = 0$ $(x-4)^2 + y^2 = 16$ $(x+4)^2 + y^2 = 8$ $(x-4)^2 + y^2 = 8$ $x^2 - 8x + y^2 - 8 = 0$

Letting i denote $\sqrt{-1}$, $\frac{1}{5+i} =$

$\frac{5-i}{26}$ $\frac{5+i}{26}$ $\frac{5-i}{24}$ $\frac{5-i}{4}$ $\frac{5+i}{24}$

If $x \ge 0$ then $\sin\left(\arctan(\sqrt{x^2+2x})\right) =$

$\frac{\sqrt{x^2+2x}}{x+1}$ $\frac{\sqrt{x^2+2x}}{1-2x-x^2}$ $\frac{x+1}{\sqrt{x^2+2x}}$ $\frac{x+1}{x^2+2x}$ $\frac{x^2+2x}{x+1}$