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1. [illegible]

(a) [illegible] $y = \sqrt{5x^2 - \sin x}$.

(b) [illegible] $\displaystyle\int \frac{\arcsin(x)}{\sqrt{1-x^2}}\,dx$ .

(c) [illegible] $\displaystyle\int_0^{\ln\sqrt{3}} \frac{e^x}{1+e^{2x}}\,dx$ .

(d) [illegible] $\displaystyle\int_1^5 \ln\left(\frac{x}{x+1}\right) dx$ [illegible] $n = 4$ [illegible]

(e) [illegible] $\displaystyle\lim_{x\to\infty} 2x \sinh\left(\frac{3}{x}\right)$ .

Solution:

(a) $\dfrac{dy}{dx} = \dfrac{10x - \cos x}{2\sqrt{5x^2 - \sin x}}$.

(b) [illegible] $u = \arcsin(x)$. [illegible] $du = \frac{1}{\sqrt{1-x^2}}\,dx$

$$
\begin{aligned}
\int \frac{\arcsin(x)}{\sqrt{1-x^2}}\,dx &= \int u\,du \\
&= \frac{1}{2}u^2 + C \\
&= \frac{1}{2}(\arcsin(x))^2 + C.
\end{aligned}
$$

(c) [illegible] $u = e^x$. [illegible] $du = e^x\,dx$, [illegible] $u = e^{\ln\sqrt{\ }}$ [illegible]

$$\lim_{x \to \infty} 2x \sinh\left(\frac{3}{x}\right) = \lim_{x \to \infty} \frac{2\sinh\left(\frac{3}{x}\right)}{\frac{1}{x}}$$

$$\stackrel{H}{=} \lim_{x \to \infty} \frac{\cosh\left(\frac{3}{x}\right)\left(\frac{-6}{x^2}\right)}{\frac{-1}{x^2}}$$

$$= \lim_{x \to \infty} 6\cosh\left(\frac{3}{x}\right)$$

$$= 6.$$

2. [illegible]

(a) [illegible] $f(x)$, [illegible] $x = a$

(b) [illegible] $f(x)$ [illegible] $[-1, 1]$ [illegible]

$$f(x) = \begin{cases} 2\sin^{-1}(x) & \text{if } x < \frac{1}{2} \\ c & \text{if } x = \frac{1}{2} \\ \cos^{-1}(x) & \text{if } x > \frac{1}{2}. \end{cases}$$

[illegible] $c$ [illegible] $f$ [illegible] $x = \frac{1}{2}$

[illegible] $h'(x) = \frac{1}{\sqrt{x}} - \frac{1}{4}$. [illegible] $h'(x)$ [illegible] $h(x)$ [illegible] $h'(x) = 0$ [illegible]

[illegible] $x = 16$, [illegible] $x = 16$ [illegible] $h(x)$: [illegible] $h'(x) > 0$ [illegible] $0 < x < 16$ [illegible] $h'(x) < 0$ [illegible] $x > 16$, [illegible] $h(x)$ [illegible] $x = 16$, [illegible]

[illegible] $r'(x) = 2\sqrt{\tan(x)} - \frac{1}{4}\tan(x) \sec^2(x)$:

4. [illegible] $s(x) = \frac{e^{2x}}{3 - e^{2x}}$.

[illegible] $s'(1)$: [illegible] $e$ )

[illegible] $s(x)$. [illegible] $s^{-1}(x)$: [illegible]

[illegible] $s(x)$ [illegible]

[illegible] $s(x)$: [illegible]

[illegible] $s(x)$: [illegible]

Solution:

[illegible]

$$s(x) = \frac{e^{2x}}{3 - e^{2x}} \cdot e^{-}$$

[illegible] $\frac{1}{1}$

[illegible]

$$
\begin{aligned}
\frac{d}{td} &= \frac{\cos^2(\ )}{9}\,\frac{xd}{td} \\
&= \frac{(9=15)^2}{9} \cdot 3 \\
&= \frac{3}{25}\ \text{[illegible]} \qquad :
\end{aligned}
$$

[illegible] cos [illegible]
[illegible]