Name: Key

Unit 5 Five 'n One- Morning

Calculator Inactive

1)E 2)A 3)B 4)C 5)B

1. E	What are all horizontal asymptotes of the graph of $y=\frac{5+2^x}{1-2^x}$ in the xy-plane? (A) $y=-1$ only (B) $y=0$ only (C) $y=5$ only (D) $y=-1$ and $y=0$ (E) $y=-1$ and $y=5$ $\lim_{x\to\infty}\frac{5+2^x}{1-2^x}$ L'H: $\frac{\cancel{2^x}\cdot \cancel{\ln 2}}{-\cancel{2^x}\,\cancel{\ln 2}}=-1$ $\lim_{x\to-\infty}\frac{5+2^x}{1-2^x}=\frac{5+\left(\frac{1}{2^x}\right)^0}{1-\left(\frac{1}{2^x}\right)^0}=\frac{5}{1}=5$
2. A	What is the slope of the line tangent to the curve $y=\arctan(4x)$ at the point at which $x=\frac{1}{4}$? (A) 2 (B) $\frac{1}{2}$ (C) 0 (D) $-\frac{1}{2}$ (E) -2 $\frac{1}{1+(4x)^2}\cdot 4=\frac{4}{1+16x^2}=\frac{4}{1+16\left(\frac{1}{4}\right)^2}=\frac{4}{1+16\left(\frac{1}{16}\right)}=\frac{4}{2}=2$
3. B	The function $f(x)=x^5+3x-2$ passes through the point (1, 2). Let f^{-1} denote the inverse of f. Then $(f^{-1})'(2)$ equals a) 1/83 b) 1/8 c) 1 d) 8 e) 83 $f\ (1, 2)$ $f^{-1}(2, 1)$ $\frac{1}{f'(1)}=\frac{1}{8}$ $f'(x)=5x^4+3$ $f'(1)=5+3=8$
4. C	$\int\frac{dx}{x^2+2x+2}=$ a. $\ln(x^2+2x+2)+C$ b. $\ln\|x+1\|+C$ c. $\arctan(x+1)+3$ d. $\frac{1}{\frac{1}{3}x^3+x^2+2x}+C$ e. $-\frac{1}{x}+\frac{1}{2}\ln\|x\|+\frac{x}{2}+C$ $x^2+2x+\boxed{1}+2-\boxed{1}$ $(x+1)^2+1$ $\int\frac{1}{(x+1)^2+1}dx$
5. B	$\lim_{x\to0}\frac{\int_1^{1+x}\frac{\cos t}{t}dt}{x}$ is A -cos1 B cos1 C -sin1 D sin1 E Does not exist L'H; $\frac{\frac{\cos(1+x)}{1+x}}{1}$ cos1

Scanned by CamScanner

Let f be the function defined by $f(x) = e^x \cos x$ with domain $[0, 2\pi]$.

a) Find the **absolute** minimum value of f(x)

(1) $f'(x) = e^x(-\sin x) + \cos x \cdot e^x$

$f'(x) = e^x(\cos x - \sin x) = 0$

$\cos x = \sin x$

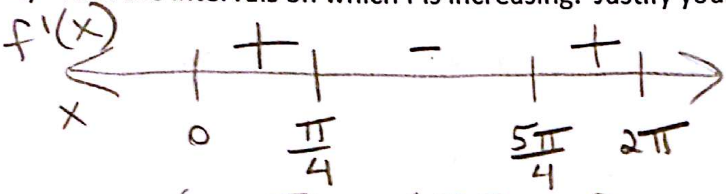
$x = \frac{\pi}{4}, \frac{5\pi}{4}$

x	y (1)
0	1
$\pi/4$	$e^{\pi/4} \cdot \sqrt{2}/2$
$5\pi/4$	$e^{5\pi/4} \cdot (-\sqrt{2}/2)$
2π	$e^{2\pi} \cdot 1$

(1)

Abs min value $= -\frac{\sqrt{2}}{2} e^{5\pi/4}$

b) Find the intervals on which f is increasing. Justify your answer



$e^{\pi/6}(\cos\frac{\pi}{6} - \sin\frac{\pi}{6})$

$e^{\pi/6}(\frac{\sqrt{3}}{2} - \frac{1}{2})$

$e^{\pi/2}(\cos\frac{\pi}{2} - \sin\frac{\pi}{2})$

$e^{\pi/2}(0 - 1)$

$e^{7\pi/4}(\cos 7\pi/4 - \sin 7\pi/4)$

$e^{7\pi/4}(\frac{\sqrt{2}}{2} - (-\frac{\sqrt{2}}{2}))$

Inc : $(0, \frac{\pi}{4}) \cup (\frac{5\pi}{4}, 2\pi)$ (1)

b/c $f'(x)$ is pos

c) Find the x-coordinate of each point of inflection on the graph

(1) $f''(x) = e^x(-\sin x - \cos x) + (\cos x - \sin x)e^x$

$f''(x) = -e^x \sin x - \cancel{e^x \cos x} + \cancel{e^x \cos x} - e^x \sin x$

$f''(x) = -2e^x \sin x = 0$

$x = 0, \pi, 2\pi$

PoI: $x = \pi$ (1)

d) Estimate the function when $x = \left(\frac{\pi}{2} + .1\right)$ using the tangent line approximation at $\frac{\pi}{2}$. Is your estimate greater than or less than the true value? Give a reason for your answer.

$f(\frac{\pi}{2}) = e^{\pi/2} \cdot \cos\frac{\pi}{2} = 0$

$f'(\frac{\pi}{2}) = e^{\pi/2} \cdot (\cos\frac{\pi}{2} - \sin\frac{\pi}{2}) = e^{\pi/2}(-1) = -e^{\pi/2}$

$y = -e^{\pi/2}(x - \frac{\pi}{2})$ (1)

(1) $y(\frac{\pi}{2} + .1) = -e^{\pi/2}(\frac{\pi}{2} + .1 - \frac{\pi}{2})$

$= -e^{\pi/2}(.1)$

$= -.1 e^{\pi/2}$

At $x = \frac{\pi}{2}$, (1) graph is CC↓ so estimate is greater than actual