Name________________________________ Date______________________ Period_____________

Calculus Test: 2.1 to 3.1. No Calculator

MULITPLE CHOICE: Show all work on attached paper. Put the CAPITAL letter in the blank.

_____ 1. If $f(3)=2$, $g(3)=-\frac{3}{2}$, $f'(3)=-2$, $g'(3)=5$, and $h(x)=\left[f(x)+2g(x)\right]^3$, find $h'(3)$.

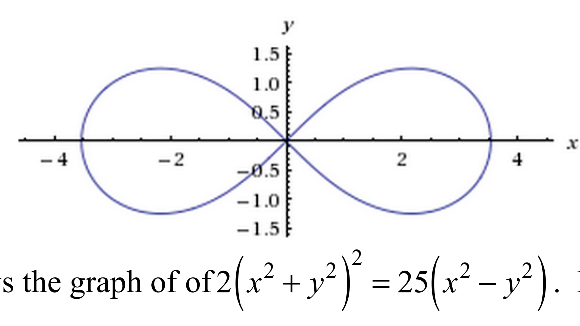
(A) $-24$ (B) 24 (C) 1 (D) $-1$ (E) 42

_____ 2. If $f(x)=\sqrt{\tan\left(2x-\frac{3\pi}{4}\right)}$, find $\lim\limits_{x\to\pi/2}\frac{f(x)-f(\pi/2)}{x-\pi/2}$

(A) 2 (B) $-2$ (C) $\frac{1}{2}$ (D) $-\frac{1}{2}$ (E) 4

_____ 3. If $x^2+y^2=k$ where $k$ is a non-zero constant, in which quadrants is $\frac{d^3y}{dx^3}<0$?

(A) I and III only (B) I and II only (C) III and IV only (D) II and IV only (E) all quadrants




_____ 4. The figure above shows the graph of of $2\left(x^2+y^2\right)^2=25\left(x^2-y^2\right)$. Find the $y$-intercept of the tangent line to the above graph at $(-3,1)$.

(A) $\left(0,\frac{14}{13}\right)$ (B) $\left(0,\frac{5}{2}\right)$ (C) $(0,10)$ (D) $\left(0,\frac{40}{13}\right)$ (E) $(0,3)$

_____ 5. If $f(x)=(\sin x)^{\ln x}$, then $f'(x)=$

(A) $\dfrac{\ln(\sin x)\cdot(\sin x)^{\ln x}}{x}$ (B) $\dfrac{\ln(\sin x)}{x}+\ln x(\cot x)$ (C) $(\ln x)(\sin x)^{\ln x-1}$

(D) $\dfrac{(\sin x)^{\ln x}}{x}$ (E) $\left(\dfrac{\ln(\sin x)}{x}+\ln x(\cot x)\right)(\sin x)^{\ln x}$

_____ 6. The line $y=16x+16$ is tangent to the graph of $y=x^3+4x$ at

I. $x=2$

II. $x=-2$

III. $x=-4$

(A) I only (B) II only (C) II and III only (D) I and III only (E) I, II, and III

_____ 7. If $f(x)=3\cos(x)+e^{\pi-x}$, $f(\pi)=-2$, and $f(g(x))=x=g(f(x))$, then what is the value of $g'(-2)$?

(A) $-3\sin(-2)-e^{\pi 2}$ (B) 1 (C) $-1$ (D) $\dfrac{1}{-3\sin(-2)-e^{\pi 2}}$ (E) $-\dfrac{1}{2}$

_____ 8. If $f(x)=\ln\sqrt[5]{|\cos x|}$, find $f'(x)$.

(A) $-\dfrac{1}{5}\tan x$ (B) $\dfrac{1}{5}|\tan x|$ (C) $-\dfrac{1}{5}\cot x$ (D) $\dfrac{1}{(\cos x)^{1/5}}$ (E) $\dfrac{-\sin x}{(\cos x)^{1/5}}$

_____ 9. Let $h(x)=e^{f(3x)}$. If $f(3)=-2$ and $h'(1)=e^2$, find $f'(3)$.

(A) $e^4$ (B) $3e^2$ (C) $e^2$ (D) $\dfrac{e^4}{3}$ (E) $\dfrac{e^2}{3}$

_____ 10. If $f(x)=2^x-\ln 2\cdot\log_2 x+e^{2\ln x}$, what is the slope of the tangent line to $f(x)$ at $x=1$?

(A) $\ln(4)$ (B) $\ln\left(\dfrac{4}{e}\right)$ (C) $-\ln(4e)$ (D) $-\ln(4)$ (E) $\ln(4e)$

_____ 11. The graph of $g(x)=\dfrac{e-\ln 2x}{x}$ has a horizontal tangent line at what $x$-value?

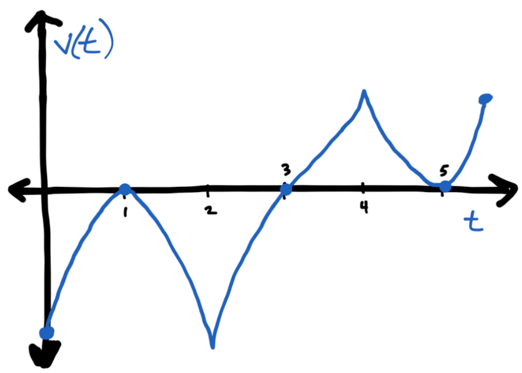
(A) $\dfrac{1}{2}e^{-e-1}$ (B) $\dfrac{1}{2}e^{e+1}$ (C) $e^{e+1}$ (D) $e^{-e-1}$ (E) $\dfrac{1}{2}e^{e-1}$

_____ 12. The graph of the equation $x^2+4x=6+3y+3y^{-1}$ passes through many points, including the following 6: $(-6,1)$, $(2,1)$, $(0,-1)$, $(-2,-3)$, $\left(-2,-\dfrac{1}{3}\right)$, and $(-4,-1)$. These 6 points are either points of horizontal tangent lines (H), vertical tangent lines (V), or neither. How many of each type of tangent lines does this graph have at these points?

(A) 2H, 4V (B) 4H, 2V (C) 3H, 2V (D) 2H, 2V (E) 2H, 0V

______ 13. A baby unicorn is moving along a horizontal line and has velocity $v(t)=\ln(t-t^2)$ for all values $0<t<1$. For what value(s) of $t$ is the <u>speed</u> of the cute, baby unicorn <u>decreasing</u>?

(A) $0<t<1$ (B) $0<t<\frac{1}{2}$ (C) $\frac{1}{2}<t<1$ (D) $\frac{1}{4}<t<\frac{3}{4}$ (E) no such values




______ 14. A big nerd is walking along down a straight road towards his compass with a velocity function $v(t)$ as shown in the figure above. For what values of $t$ does the nerd change direction?

(A) 1, 2, 4, and 5 only (B) 1 and 5 only (C) 2 and 4 only (D) 1, 2, and 5 only (E) 3 only

______ 15. If $f(x)=\cos(\cot^{-1}x)$, find $f'(x)$.

(A) $\frac{-1}{\sqrt{1+x^2}}$ (B) $\frac{1}{\sqrt{1+x^2}}$ (C) $\frac{1}{\sqrt{(1-x^2)^3}}$ (D) $\frac{1}{\sqrt{1-x^2}}$ (E) $\frac{1}{\sqrt{(1+x^2)^3}}$

______ 16. Find the equation of the <u>normal line</u> to $g(x)=\arctan(\ln x)$ at $x=e$.

(A) $y=-2e(x-e)$ (B) $y=\frac{\pi}{4}-2(x-e)$ (C) $y=-2(x-e)$ (D) $y=\frac{\pi}{4}-2e(x-e)$ (E) $y=\frac{\pi}{2}-2e(x-e)$