Name: _____ Date: _____
AP Calculus AB

Do Now: (Calculator Active)

1. Which of the following is an equation of the tangent line to the graph of $f(x)=\frac{x^4}{4}-x^3$ at the point where $f'(x)=1$?

(A) $y=x+3.5954$ (B) $y=x-9.803$ (C) $y=x-3.056$

(D) $y=x-1$ (E) $y=3x-1$

Plan:

need to find pt of tangency (A,B)

$A = 3.1038\ldots$

$B = Y_1(A)$

$f(A)$

$y-B=1(x-A)$

$y-f(A)=1(x-A)$

$y=x-A+f(A)$

$y=x-9.803\ldots$

Please work on Set C from the AP Calculus AB Practice Multiple Choice

Homework 10-23

Name: _____ Date: _____

AP Calc AB: Calculator Active Questions Homework Ms. Loughran

xmin ↓ ↓ xmax

1. For $f(x) = \sin^2 x$ and $g(x) = 0.5x^2$ on the interval $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$, the instantaneous rate of change f is greater than the instantaneous rate of change of g for which value of x?

$f' > g'$

(A) -0.8 (B) 0 (C) 0.9 (D) 1.2 (E) 1.5

xmin ↓ ↓ xmax

2. At how many points in the interval $-2\pi \le x \le 2\pi$ does the tangent line to the graph of the curve $y = x\cos x$ have a slope of $\frac{\pi}{2}$?

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

$y_1 = x\cos x$
$y_2 =$ derivative
$y_3 = \pi/2$

3. Let f be the function given by $f(t) = 2\pi t + \sin(2\pi t)$.

(a) Find the value(s) of t in the open interval $(0,2)$ for which the line tangent at $(t, f(t))$ is parallel to the line through $(0,0)$ and $(2,4\pi)$. $t = .25, .75, 1.25, 1.75$

(b) Suppose the given function describes the position of a particle on the x-axis for time $0 \le t \le 2$. What is the average velocity of the particle over that interval? 6.283

(c) Determine the velocity and acceleration of the particle at $t = 1$.

$v(1) = 12.566$
$a(1) = 0$

a) $m = \frac{4\pi - 0}{2 - 0} = 2\pi$

b) $\frac{f(2) - f(0)}{2 - 0} = 6.283$

Set C

1. If $f(x) = x + \sin x$, then $f'(x) =$

a) $1 + \cos x$ b) $1 - \cos x$ c) $\cos x$ d) $\sin x - x\cos x$ e) $\sin x + x\cos x$

2. If $y = \cos^2 3x$, then $\frac{dy}{dx} =$

a) $-6\sin 3x\cos 3x$ b) $-2\cos 3x$ c) $2\cos 3x$ d) $6\cos 3x$ e) $2\sin 3x\cos 3x$

3. An equation of the line tangent to the graph of $f(x) = x(1-2x)^3$ at the point $(1, -1)$ is

a) $y = -7x + 6$ b) $y = -6x + 5$ c) $y = -2x + 1$ d) $y = 2x - 3$ e) $y = 7x - 8$

$f'(x) = x \cdot 3(1-2x)^2 \cdot -2 + (1-2x)^3$

$f'(1) = 1 \cdot 3(1-2(1))^2 \cdot -2 + (1-2(1))^3$

$-6 + (-1) = -7$

$y + 1 = -7(x-1)$

$y + 1 = -7x + 7$

$y = -7x + 6$

4. $\frac{d}{dx}\left(\frac{1}{x^3} - \frac{1}{x} + x^2\right)$ at $x = -1$ is

a) -6 b) -4 c) 0 d) 2 e) 6

5. If $f(x) = \sin x$, then $f'\left(\frac{\pi}{3}\right) =$

a) $-\frac{1}{2}$ b) $\frac{1}{2}$ c) $\frac{\sqrt{2}}{2}$ d) $\frac{\sqrt{3}}{2}$ e) $\sqrt{3}$

$(2x)^{\frac{1}{2}}$

6. If $f(x) = \sqrt{2x}$, then $f'(2) =$

a) $\frac{1}{4}$ b) $\frac{1}{2}$ c) $\frac{\sqrt{2}}{2}$ d) 1 e) $\sqrt{2}$

$f'(x) = \frac{1}{2}(2x)^{-\frac{1}{2}} \cdot 2 = (2x)^{-\frac{1}{2}}$ or $\frac{1}{\sqrt{2x}}$

$f'(2) = \frac{1}{\sqrt{2(2)}} = \frac{1}{2}$

7. The $\lim_{h\to 0}\dfrac{\tan 3(x+h)-\tan 3x}{h}$ is

a) 0 b) $3\sec^2(3x)$ c) $\sec^2(3x)$ d) $3\cot(3x)$ e) nonexistent

8. If $f(x)=(x-1)^2\sin x$, then $f'(0)=$

a) -2 b) -1 c) 0 d) 1 e) 2

$f'(x)=(x-1)^2\cos x+2(x-1)\sin x$

$f'(0)=(0-1)^2\cos 0+2(0-1)\sin 0$

$1(1)+2(-1)0$

9. If $f(x)=(x^2-2x-1)^{\frac{2}{3}}$, then $f'(0)$ is

a) $\dfrac{4}{3}$ b) 0 c) $-\dfrac{2}{3}$ d) $-\dfrac{4}{3}$ e) -2

$f'(x)=\frac{2}{3}(x^2-2x-1)^{-\frac{1}{3}}\cdot(2x-2)$

$f'(0)=\frac{2}{3}(-1)^{-\frac{1}{3}}$

$-\frac{2}{3}\cdot -2$

$\dfrac{d}{dx}\cos^2(x^3)=$

a) $6x^2\sin(x^3)\cos(x^3)$

10. b) $6x^2\cos(x^3)$

c) $\sin^2(x^3)$

d) $-6x^2\sin(x^3)\cos(x^3)$

e) $-2\sin(x^3)\cos(x^3)$

11. At what point on the graph of $y=\dfrac{1}{2}x^2$ is the tangent line parallel to the line $2x-4y=3$?

a) $\left(\frac{1}{2},-\frac{1}{2}\right)$ b) $\left(\frac{1}{2},\frac{1}{8}\right)$ c) $\left(1,-\frac{1}{4}\right)$ d) $\left(1,\frac{1}{2}\right)$ e) $(2,2)$

$2x-3=4y$

$\frac{2}{4}x-\frac{3}{4}=y$

$m=\frac{1}{2}$

$m_{\perp}=\frac{1}{2}$

$y'=x$

$x=\frac{1}{2}$

$y=\frac{1}{2}\left(\frac{1}{2}\right)^2=\frac{1}{8}$

12. The position of a particle moving along a straight line at any time t is given by $s(t)=t^2+4t+4$. What is the acceleration of the particle when $t=4$?

a) 0 b) 2 c) 4 d) 8 e) 12

13. If $y=2\cos\left(\dfrac{x}{2}\right)$, then $\dfrac{d^2y}{dx^2}=$

a) $-8\cos\left(\frac{x}{2}\right)$ b) $-2\cos\left(\frac{x}{2}\right)$ c) $-\sin\left(\frac{x}{2}\right)$ d) $-\cos\left(\frac{x}{2}\right)$ e) $-\frac{1}{2}\cos\left(\frac{x}{2}\right)$

$\dfrac{dy}{dx}=-2\sin\left(\frac{x}{2}\right)\cdot\frac{1}{2}=-\sin\left(\frac{x}{2}\right)$

$\dfrac{d^2y}{dx^2}=-\cos\left(\frac{x}{2}\right)\cdot\frac{1}{2}$