**AP Calculus – Quarterly Exam (Chapter 1 - 14)** **Name** _____

Directions: Answer each problem. Gauge your time. You have the period to complete the exam. If you do not know an answer, take your best guess. **NO CALCULATORS PERMITTED.**

1. Determine $\lim_{x\to 1} f(x)$ if $f(x)=\begin{cases}3-x, & x\neq 1\\ 1, & x=1\end{cases}$

**a.** 2 **b.** 1 **c.** $\frac{3}{2}$ **d.** Does not exist

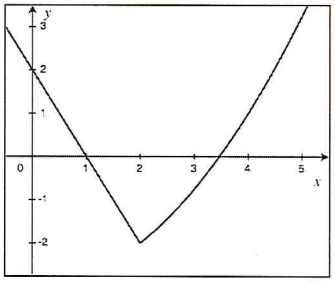
2. Find $f'(x)$ for $f(x)=(2x^2+5)^7$

**a.** $7(4x)^6$ **b.** $7(4x)^7$ **c.** $28x(2x^2+5)^6$ **d.** $7(2x^2+5)^6$

3. Find $\frac{dy}{dx}$ if $x^2+y^2=2xy$

**a.** $\frac{x}{x-y}$ **b.** $\frac{y+x}{y-x}$ **c.** 1 **d.** $\frac{-x}{y}$

4. Use the graph of $f(x)$ to the right to find $\lim_{x\to 2} f(x)$

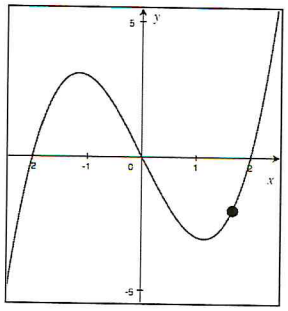



**a.** Does not exist **b.** 0
**c.** –2 **d.** 2

5. Find $\lim_{x\to 1}\frac{5}{(x-1)^2}$

**a.** 0 **b.** $-\infty$ **c.** $\frac{5}{4}$ **d.** $\infty$

6. The derivative at the indicated point is




**a.** Positive **b.** Zero **c.** Negative **d.** No Slope

7. Find $f'(x)$ if $f(x)=\dfrac{x^2-3x}{x^2}$

**a.** $\dfrac{2x-3}{x^2}$ **b.** $\dfrac{2x-3}{2x}$ **c.** $1-\dfrac{3}{x}$ **d.** $\dfrac{3}{x^2}$

8. Find $\lim\limits_{x\to 1}\dfrac{x^2+2x+3}{x^2+1}$

**a.** 0 **b.** 1 **c.** $\infty$ **d.** Does not exist

9. If $f(x)=-x^2+x$, which of the following will calculate the derivative of $f(x)$?

**a.** $\lim\limits_{\Delta x\to 0}\dfrac{\left(-x^2+x+\Delta x\right)-\left(-x^2+x\right)}{\Delta x}$

**b.** $\lim\limits_{\Delta x\to 0}\dfrac{\left[-(x+\Delta x)^2+(x+\Delta x)\right]-\left(-x^2+x\right)}{\Delta x}$

**c.** $\dfrac{\left[-(x+\Delta x)^2+(x+\Delta x)\right]-\left(-x^2+x\right)}{\Delta x}$

**d.** $\dfrac{\left(-x^2+x+\Delta x\right)-\left(-x^2+x\right)}{\Delta x}$

10. Find $\lim\limits_{x\to 5}\dfrac{x^2-3x-10}{x-5}$

**a.** 2 **b.** Does not exist **c.** 0 **d.** 7

11. If $f(x)=\sin(2x)$, find $f''(x)$

**a.** $2\cos(2x)$ **b.** $-4\sin(2x)$ **c.** $-2\sin(2x)$ **d.** $-4\sin x$

12. If the graph of the curve $x+y=4\tan y$ passes through the point $\left(\frac{16-\pi}{4},\frac{\pi}{4}\right)$, find the slope of the tangent line to this curve through that point.

**a.** $\frac{1}{7}$ **b.** 7 **c.** $-\frac{1}{2}$ **d.** $-2$

13. For which of these functions $f(x)$ does $\lim_{x\to\infty} f(x)=2$?

**a.** $\frac{x-2}{3x-5}$ **b.** $\frac{2x}{\sqrt{x-2}}$ **c.** $\frac{2x^2-6x+1}{1+x^2}$ **d.** $\frac{2x-1}{x^2+1}$

14. Find an equation of the tangent line to the graph of $f(x)=x\cos x$ when $x=\pi$.

**a.** $y=-x$ **b.** $y=0$ **c.** $y=2\pi-x$ **d.** $y=-2\pi-x$

15. Find $\frac{dy}{dx}$ for $y=\sin(x+y)$

**a.** 0 **b.** $\frac{\cos(x+y)}{1-\cos(x+y)}$ **c.** $\cos(x+y)$ **d.** 1

16. Find $\frac{d^2y}{dx^2}$ for $y=\frac{x+3}{x-1}$

**a.** 0 **b.** $y=\frac{-8}{(x-1)^3}$ **c.** $y=\frac{-4}{(x-1)^3}$ **d.** $y=\frac{8}{(x-1)^3}$

17. If $y=\tan^2(\ln x)$, find $\frac{dy}{dx}$

**a.** $2\tan(\ln x)$ **b.** $\frac{2\sin(\ln x)}{x\cos^3(\ln x)}$ **c.** $2\sec^2(\ln x)$ **d.** $\frac{2\sec^2(\ln x)}{x}$

18. Find $f'(x)$ if $f(x)=\sin^3 4x$

**a.** $4\cos^3 4x$ **b.** $3\sin^2 4x\cos 4x$ **c.** $\cos^3 4x$ **d.** $12\sin^2 4x\cos 4x$

19. If $f(1)=4$ and $f'(1)=2$, find the tangent line approximation to $f(1.5)$.

**a.** 3.5 **b.** 4 **c.** 4.5 **d.** 5

20. Find the equation of the line that passes through (3, 1) and is perpendicular to the curve $x^2+\ln y=9$.

**a.** $y-1=-6(x-3)$ **b.** $y-1=\frac{1}{6}(x-3)$ **c.** $y-1=6(x-3)$ **d.** $y-1=\frac{-1}{6}(x-3)$

21. If $f(x)=\sin(ax)$, what is $f^{50}(x)$?

**a.** $\cos(ax)$ **b.** $\sin(ax)$ **c.** $-a^{50}\sin(ax)$ **d.** $a^{50}\sin(ax)$

22. Find the derivative of $x^2 f(x)$.

**a.** $x[xf'(x)+2f(x)]$ **b.** $2xf'(x)$ **c.** $x[xf(x)+2f'(x)]$ **d.** $x^2 f'(x)$

23. Let $f(7)=-14$, $f'(7)=9$, $g(7)=2$, $g'(7)=\frac{1}{7}$. Find $h'(7)$ if $h(x)=\frac{f(x)}{g(x)}$.

**a.** $\frac{9}{7}$ **b.** 4 **c.** 5 **d.** 63

24. Which of the following functions has a derivative of 0 for all values of $x$?

I. $y=\frac{-1}{1000}$ II. $y=4\pi^2-9$ III. $y=\sin^2 x+\cos^2 x$

**a.** I and II only **b.** I and III only **c.** II and III only **d.** I, II and III

25. If $f(x)=\ln\left(e^{2x}-x\right)$, find $f'(-1)$

**a.** $\frac{2-e^2}{1+e^2}$ **b.** $\frac{e^2}{1+e^2}$ **c.** $\frac{e^2}{1-e^2}$ **d.** $\frac{1-e^2}{1+e^2}$

26. Find all points on the graph of $f(x) = -x^3 + 3x^2 - 2$ where there is a horizontal tangent line.

**a.** (0, –2), (2, 2) **b.** (0, –2) **c.** (1, 0), (0, –2) **d.** (2, 2)

27. If $f(x) = x^2 + 1$ and $g(x) = 2x - 1$, find $f'(g(x))$ at $x = 2$.

**a.** 6 **b.** 7 **c.** 12 **d.** 13

28. The function $f$ is differentiable for all real numbers. The table to the right gives the values of the function and its derivatives at $x = -1$ and $x = 1$. If $f^{-1}$ is the inverse function of $f$, find the value of $\left[f^{-1}(x)\right]'$ at $x = 1$.

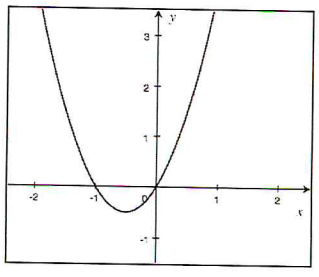
| $x$ | $f(x)$ | $f'(x)$ |
|---|---|---|
| –1 | 1 | –3 |
| 1 | –2 | 2 |

**a.** $\frac{1}{2}$ **b.** $\frac{-1}{2}$ **c.** $\frac{-1}{3}$ **d.** –1

29. Find the derivative: $f(x) = \frac{1}{\sqrt[3]{3 - x^3}}$

**a.** $\frac{-1}{3(3-x^3)^{4/3}}$ **b.** $\frac{x^2}{(3-x^3)^{4/3}}$ **c.** $\frac{-x^2}{(3-x^3)^{2/3}}$ **d.** $\frac{-x^2}{(3-x^3)^{4/3}}$

30. The graph below could represent the graph of the derivative of which of the following functions?




**a.** a constant function **b.** a linear function
**c.** a quadratic function **d.** a cubic function

**Go back and make sure all your answers are clear and erasures are complete.**

**AP Calculus – Indefinite Integration (Chapter 25)** **Name** _____

1) $\int\left(x^3-5x^2+\frac{1}{2}x-6\right)dx$

2) $\int(2x-3)^3\,dx$

3) $\int\left(\frac{5}{x^2}-\frac{5}{x^3}\right)dx$

4) $\int\left(\sqrt{x}+\frac{5}{\sqrt{x}}\right)dx$

5) $\int\left(\sqrt[3]{x}-\frac{3}{4\sqrt[3]{x}}\right)dx$

6) $\int\left(\frac{x^2-6x+3}{\sqrt{x}}\right)dx$

7) $\int(\sin x-\cos x+x)\,dx$

8) $\int\left(\frac{1}{4}\sec^2 x+6\sec x\tan x\right)dx$

9) Solve the differential equation if (Show all work)

$f''(x)=3x^2+1 \qquad f'(1)=1 \qquad f(2)=7$

**AP Calculus – *u*-substitution (Chapter 26)** **Name**_____

Evaluate the following integrals. Be sure to show your *u*-substitution steps when applicable.
(*1-8 - 2 pts, 9 - 18 - 4 pts*)

1. $\int 7x\ dx$

2. $\int \frac{-6}{x^5}\ dx$

3. $\int 7x^{2/5}\ dx$

4. $\int \frac{8}{\sqrt{t}}\ dt$

5. $\int x(4x-1)^2\ dx$

6. $\int \frac{4x^2+6x+1}{2\sqrt{x}}\ dx$

7. $\int \left(8\cos x+6\sin x-\frac{x^2}{2}\right)\ dx$

8. $\int \left(\sqrt{x}-4\right)^2\ dx$

9. $\int (3-8x)^5\ dx$

10. $\int x^2\sqrt{x^3-1}\ dx$

11. $\int \frac{2x}{(3x^2+4)^6}\,dx$

12. $\int \frac{8x+20}{\sqrt{x^2+5x+1}}\,dx$

13. $\int \left(2-\frac{2}{x}\right)^4\left(\frac{1}{x^2}\right)\,dx$

14. $\int \left[2x+\sin(1-8x)\right]\,dx$

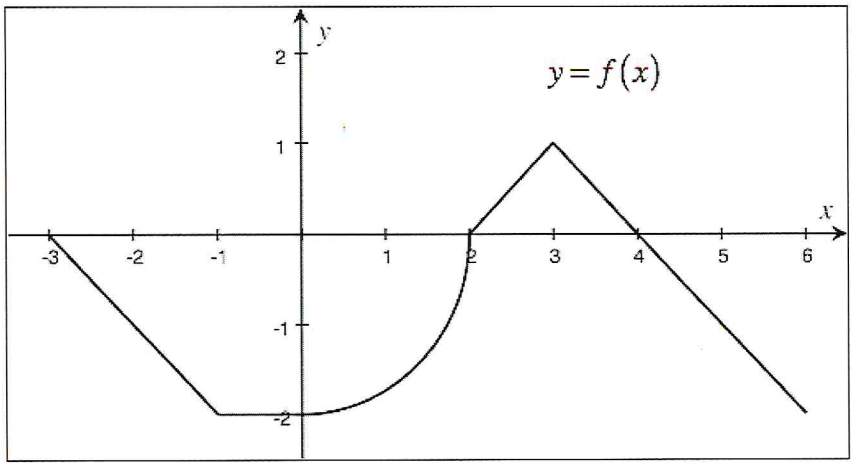
15. $\int \sin 4x\cos 4x\,dx$

16. $\int \tan^2(4x-1)\sec^2(4x-1)\,dx$

17. $\int \frac{4\sin x}{\sqrt{\cos x}}\,dx$

18. $\int (x-4)\sqrt{x+4}\,dx$

**AP Calculus – Def. Integrals/Accumulation Practice (Chapter 28-29)** **Name**_____




For problems 1-12, use the above graph for $y = f(x)$. Assume this is a series of lines and a quarter circle. Find the following:

1. $\int_0^2 f(x)\ dx$

2. $\int_3^4 f(x)\ dx$

3. $\int_2^5 f(x)\ dx$

4. $\int_4^5 f(x)\ dx$

5. $\int_5^6 f(x)\ dx$

6. $\int_2^6 f(x)\ dx$

7. $\int_6^0 f(x)\ dx$

8. $\int_{-2}^2 f(x)\ dx$

9. $\int_{-3}^0 f(x)\ dx$

10. $\int_4^{-1} f(x)\ dx$

11. $\left|\int_{-3}^2 f(x)\ dx\right|$

12. $\int_6^0 |f(x)|\ dx$

If $\int_{-4}^{-1} f(x)\,dx = -7$, $\int_{-1}^{6} f(x)\ dx = 3$ and $\int_4^6 f(x)\,dx = 6$, find the following

13. $\int_{-1}^{-4} f(x)\,dx$

14. $\int_{-1}^{4} f(x)\,dx$

15. $\int_4^6 (-4f(x)+5)\,dx$

**AP Calculus – FTC Exam Practice (Chapter 30-32)** **Name** _____

1. $\int_{-4}^{4}\left(2x^7+1\right)\,dx$

2. $\int_{-2}^{-1}-2x^4\,dx$

3. $\int_{2}^{-1}(-x^2-6x+3)\;dx$

4. $\int_{0}^{\pi/6}3\sin x\;dx$

5. $\int_{1}^{9}\left(\sqrt{x}-\frac{4}{\sqrt{x}}\right)dx$

6. $\int_{0}^{3\pi/2}(x-\cos x)\,dx$

7. $\int_{0}^{\sqrt{3}}x\left(x^2+1\right)^3dx$

8. $\int_{0}^{\pi/4}(\cos 2x)\,dx$

9. $\int_9^1 \frac{\left(3-\sqrt{x}\right)^3}{\sqrt{x}}\,dx$

10. $\int_1^8 \frac{e^{\sqrt[3]{x}}}{\sqrt[3]{x^2}}dx$

11. $\int_0^1 \frac{e^{2x}}{1+e^{2x}}\,dx$

12. $\int_{-1}^1 \frac{x+1}{x+3}\,dx$

13. Let $F(x)$ be an antiderivative of $\frac{x}{\ln x}$.
If $F(2)=3$, find $F(5)$.

14. Let $F(x)$ be an antiderivative of $e^{\cos x}$.
If $F(\pi)=6.5$, find $F(0)$.

If $\int_0^1 f(x)\,dx=a$, $\int_0^2 f(x)\,dx=a+5$ and $\int_0^4 f(x)\,dx=a-8$, find

15. $\int_0^2 f(2x)dx$

16. $\int_0^2 \left[f\left(\frac{1}{2}x\right)+1\right]dx$