AP CALCULUS Name ______________________________
ANTIDERIVATIVES & INITIAL VALUE PROBLEMS PRACTICE

1) $\int \pi^3 \, dx =$

A) $3\pi^2 x + c$
B) 0
C) $\pi^3 x + c$
D) $3\pi^2 + c$
E) $\frac{\pi^4}{4} + c$

2) $\int \left(x^4 - x^3 + x^2\right) dx =$

A) $\frac{x^5}{4} - \frac{x^4}{3} + \frac{x^3}{2} + c$
B) $5x^5 - 4x^4 + 3x^3 + c$
C) $\frac{x^5}{5} - 3x^2 + \frac{x^3}{3} + c$
D) $4x^3 - 3x^2 + 2x + c$
E) $\frac{x^5}{5} - \frac{x^4}{4} + \frac{x^3}{3} + c$

3) $\int \left(x^2 + 2\right)\left(1 - x\right) dx =$

A) $\frac{x^3}{3} - 2x^2 + c$
B) $-\frac{x^4}{4} + \frac{x^3}{3} - x^2 + c$
C) $-3x^2 + 2x - 2 + c$
D) $-\frac{x^4}{4} + \frac{x^3}{3} - x^2 + 2x + c$
E) $\left(\frac{x^3}{3} - 2x\right)(x - x^2) + c$

4) $\int \left(x^2 - 2\right)^2 dx =$

A) $\left(\frac{x^2 - 2}{3}\right)^3 + c$
B) $\frac{(x^2 - 2)^3}{6x} + c$
C) $\frac{2x}{3}(x^2 - 2)^3 + c$
D) $\left(\frac{x^3}{3} - 2x\right)^2 + c$
E) $\frac{x^5}{5} - \frac{4x^3}{3} + 4x + c$

5) $\int x^3 \left(x^3 - 2\right) dx =$

A) $\frac{x^7}{7} - \frac{x^4}{2} + c$
B) $\frac{x^4}{4}\left(\frac{x^4}{4} - 2x\right) + c$
C) $\frac{3(x^3 - 3)^2}{2} + c$
D) $3x^2\left(\frac{x^4}{4} - 2x\right) + c$
E) $6x^5 - 6x^2 + c$

6) $\int \frac{3x^5 + 2x^3 - x^2}{x^2} dx =$

A) $\frac{x^6 + x^4 - x^3}{6x^3} + c$
B) $\frac{15x^4 + 6x^2 - 2x}{2x} + c$
C) $18x^6 + 8x^2 - 2x + c$
D) $3x^4 + 2x^2 - x + c$
E) $\frac{3}{4}x^4 + x^2 - x + c$

7) $\int \frac{1}{\sqrt{x}}\,dx =$

A) $\frac{1}{2}x\sqrt{x} + c$

B) $\frac{2}{3}x\sqrt{x} + c$

C) $-\frac{1}{2}x\sqrt{x} + c$

D) $2\sqrt{x} + c$

E) $\frac{1}{2}\sqrt{x} + c$

8) $\int \frac{1}{\sqrt[3]{x^2}}\,dx =$

A) $\frac{3}{2}x^{\frac{2}{3}} + c$

B) $-\frac{1}{3}x^{-\frac{1}{3}} + c$

C) $3x^{\frac{1}{3}} + c$

D) $\frac{1}{3}x^{\frac{1}{3}} + c$

E) $-3x^{-\frac{1}{3}} + c$

9) $\int \left(\frac{3}{u^{\frac{3}{4}}} - 4\sqrt[3]{u} + 1 \right) du =$

A) $\frac{21}{4u^{\frac{7}{4}}} - \frac{1}{3}u^{\frac{4}{3}} + u + c$

B) $\frac{3}{4}u^{\frac{1}{4}} - \frac{16}{3}u^{\frac{4}{3}} + u + c$

C) $12u^{\frac{3}{4}} - 3u^{\frac{5}{3}} + u + c$

D) $\frac{4}{3}u^{\frac{1}{4}} - \frac{3}{16}u^{\frac{4}{3}} + u + c$

E) $12u^{\frac{1}{4}} - 3u^{\frac{4}{3}} + u + c$

10) $\int \left(\sqrt[4]{x^3} - \frac{2}{\sqrt[3]{x^2}} \right) dx =$

A) $\frac{3}{4\sqrt[4]{x}} - \frac{4}{3\sqrt[3]{x}} + c$

B) $\frac{4}{7}\sqrt[4]{x^3} - \frac{2}{3}\sqrt[3]{x} + c$

C) $\frac{4}{7}x\sqrt[4]{x^3} - 6\sqrt[3]{x} + c$

D) $\frac{4}{7}x\sqrt[4]{x^3} - \frac{6}{5}x\sqrt[3]{x^2} + c$

E) $\frac{7}{4}x\sqrt[4]{x^3} - \frac{5}{6}x\sqrt[3]{x^2} + c$

11) If $g'(x) = 4x^3 + 3x^2 + 6x$ and $g(1) = -3$, then $g(x) =$

A) $x^4 + x^3 + 6x^2 - 11$

B) $\frac{x^4}{4} + \frac{x^3}{3} + 3x^2 - \frac{79}{12}$

C) $12x^2 + 6x + 6$

D) $x^4 + x^3 + 3x^2$

E) $x^4 + x^3 + 3x^2 - 8$

12) Which of the following defines a function f such that $f'(x) = \sqrt{x}$ and the graph of function f pass through the point (9,0)?

A) $f(x) = \frac{2}{3}x\sqrt{x} - 18$

B) $f(x) = x\sqrt{x} - 3x$

C) $f(x) = \frac{x\sqrt{x}}{3} + 9$

D) $f(x) = \frac{1}{2}\sqrt{x} - 3$

E) $f(x) = \frac{3}{2}x\sqrt{x} - 18$

13) The slope of a curve at each point (x,y) is given by $4x - 1$. Which of the following is an equation for this curve if it passes through the point (-2,3)?

A) $y = 2x^2 - x - 7$
B) $y = 4x^2 - x - 15$
C) $y = 2x^2 - x + 7$
D) $y = x^2 - 4x - 9$
E) $y = 2x^2 - x$

14) If function f has a derivative defined by $f'(x) = \frac{x+1}{\sqrt{x}}$ and f(1) = 0, then f(4) =

A) $\frac{20}{3}$
B) $-\frac{4}{3}$
C) $\frac{4}{3}$
D) $-\frac{8}{3}$
E) $\frac{3}{4}$

15) The slope of the line tangent to the graph of a function f at any point (x,y) is given by $x^3 - x$. If the graph of function f passes through the point (2,1), find f(0).

A) 1
B) 2
C) 3
D) -1
E) 0

16) A function f has a derivative $f'(x) = 3 - 2x$. An equation of the line tangent to the graph of function f at $x = 2$ is $y - 7 = -(x - 2)$. What is an equation of function f?

A) $f(x) = -x^2 + 3x$
B) $f(x) = -3x^2 + x - 3$
C) $f(x) = -x^2 + 3x - 3$
D) $f(x) = 3x^2 + 3x - 1$
E) $f(x) = x^2 - 3x + 3$

17) If $h''(x) = x - 2$, $h'(4) = 0$, and $h(0) = 4$, then $h(x) =$

A) $\frac{x^3}{6} - x^2 + 4$
B) $2x^3 - x^2 + 4$
C) $\frac{x^3}{3} - \frac{x^2}{2} + 4$
D) $\frac{x^3}{6} - x^2$
E) $\frac{1}{2}x^2 + 2x + 4$

18) At each point (x,y) on a curve, $\frac{d^2y}{dx^2} = 6x$. Additionally, the line $y = 6x + 4$ is tangent to the curve at $x = -2$. Which of the following is an equation of the curve that satisfies these conditions?

A) $y = 6x^2 - 32$
B) $y = x^3 - 6x - 12$
C) $y = 2x^3 - 3x$
D) $y = x^3 - 6x + 12$
E) $y = 2x^3 + 3x - 12$