

### Summer Practice

In order to be successful in AP Calculus, you must have certain prerequisite skills mastered. **You will be quizzed on the topics listed below during the first week of school. There will be no reassessment for this quiz. You will not be permitted to use a calculator during the quiz.** Complete this practice over the summer. Copy each problem and show your work neatly on lined paper in an organized manner. If you have difficulty, it is your responsibility to find help and review the topics thoroughly before the new school year begins. If you have any questions about the course, please contact Mr. Kraft (AP Calculus BC) or Mr. Cangelosi (AP Calculus AB) at the e-mail addresses below. (Please note that we may not access our school e-mail accounts frequently during the summer.)

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#### NO CALCULATOR:

##### (1) Factor the following expressions, if possible:

- (a)  $x^2 - 11x + 28$       (b)  $2x^2 - 7x - 15$       (c)  $20x^2 + 39x + 18$       (d)  $x^2 - 7x$       (e)  $16x^3 + 6x^2$   
 (f)  $x^2 + 81$       (g)  $4x^2 - 9$       (h)  $x^3 + y^3$       (i)  $8x^6 - 27$

##### (2) Simplify, if possible:

- (a)  $2x + 8$       (b)  $\frac{5x^2 + 15x}{10x^4 + 30x}$       (c)  $\frac{8x - 3}{4x + 2}$       (d)  $\frac{x^2 - x - 6}{x^2 - 4x + 3}$

##### (3) Solve for $x$ :

- (a)  $7(-2x + 3) = 14$       (b)  $6x - 10 = -4x + 40$   
 (c)  $3x^2 = -15x$       (d)  $2x^2 - 17x = 9$   
 (e)  $\ln x = 5$       (f)  $\log_4(x + 3) = 2$   
 (g)  $e^x = 10$       (h)  $5^{3x} - 1 = 3$   
 (i)  $3e^{2x} = 50$       (j)  $\sqrt{x^2 - 17} = x - 1$   
 (k)  $\sqrt{4 + x} + 0.5x(4 + x)^{-1/2} = 0$       (l)  $x^2e^{-x} - 2xe^{-x} = 0$   
 (m)  $2x^3 - 4x^2 + 5x + 3 = x^3 + x^2 + 19x + 3$       (n)  $|2x - 3| = 7$   
 (o)  $-\frac{1}{x+2} = \frac{1}{2} + \frac{1}{3}$       (p)  $\frac{3}{x-5} + \frac{2}{x+1} = \frac{6}{x^2 - 4x - 5}$   
 (q)  $\frac{x^2 - 5}{2x + 1} = 0$

**(4) Using your knowledge of the unit circle, evaluate:**

- (a)  $\sin \pi$       (b)  $\sin 0$       (c)  $\sin \frac{3\pi}{2}$       (d)  $\sin \frac{\pi}{3}$       (e)  $\sin \frac{5\pi}{4}$   
(f)  $\cos 0$       (g)  $\cos \frac{\pi}{2}$       (h)  $\cos \pi$       (i)  $\cos \frac{\pi}{6}$       (j)  $\cos \frac{5\pi}{3}$   
(k)  $\tan 0$       (l)  $\tan \frac{\pi}{2}$       (m)  $\tan \frac{3\pi}{2}$       (n)  $\tan \frac{\pi}{4}$       (o)  $\tan \frac{5\pi}{6}$   
(p)  $\csc 0$       (q)  $\csc \frac{\pi}{6}$       (r)  $\sec 0$       (s)  $\sec \frac{\pi}{4}$       (t)  $\cot \frac{\pi}{2}$       (u)  $\cot \frac{7\pi}{4}$   
(v)  $\sin^{-1}\left(\frac{\sqrt{2}}{2}\right)$       (w)  $\cos^{-1} 0$       (x)  $\sec^{-1} 1$

**(5) Simplify the following trig expressions:**

- (a)  $\sin x \cot x$       (b)  $\tan x \csc x \cos x$       (c)  $\frac{\sin^2 x}{\csc^2 x}$       (d)  $\sec x \sin x \cos x$

**(6) Simplify without any negative exponents in the final answer:**

- (a)  $x^2 \bullet x^7$       (b)  $4x^{-3} \bullet x$       (c)  $(3x^5 y^{-4})(5x^{-8} y^9)$   
(d)  $\frac{x^{10}}{x^4}$       (e)  $\frac{x^{-3}}{x^7}$       (f)  $\frac{-8x^4 y^3}{4x^6 y}$   
(g)  $(x^2)^5$       (h)  $\left(\frac{x^6}{y^{-2}}\right)^{-1}$       (i)  $(9x^4)^3$   
(j)  $x^0 y^7$       (k)  $\left(\frac{512\sqrt{x}}{x^7} - \sin x\right)^0$

**(7) Rewrite in exponential form:**      (a)  $\sqrt[3]{x}$       (b)  $\sqrt[5]{x^2}$

**(8) Rewrite in radical form:**      (a)  $x^{1/2}$       (b)  $x^{-3/4}$

**(9) Simplify:**      (a)  $\sqrt{64x^2 y^{10}}$       (b)  $\sqrt{\frac{16x^4}{100}}$

**(10) Sketch the following equations as accurately as you can. Use your knowledge of the transformation rules.**

(a)  $y = 4x - 2$

(b)  $y = 7$

(c)  $x = -3$

(d)  $y = x^2$

(e)  $y = x^2 + 3$

(f)  $y = x^3$

(g)  $y = (x + 2)^3$

(h)  $y = \ln x$

(i)  $y = \ln x - 4$

(j)  $y = \sin x$

(k)  $y = \sin\left(x - \frac{\pi}{2}\right)$

(l)  $y = e^x$

(m)  $y = -e^x$

(n)  $y = e^{-x}$

(o)  $y = \cos x$

(p)  $y = 2\cos x$

(q)  $y = \frac{1}{2}\cos x$

(r)  $y = |x|$

(s)  $y = |4x|$

(t)  $y = \left|\frac{1}{4}x\right|$

(u)  $y = \begin{cases} 3x, & x < 0 \\ x^2, & x \geq 0 \end{cases}$

(v)  $y = \begin{cases} 2x + 3, & x > 1 \\ 5, & x = 1 \\ x^3, & x < 1 \end{cases}$

**(11) Rewrite in exponential form:** (a)  $\log_3 9 = 2$

(b)  $\log_4 \frac{1}{16} = -2$

**(12) Rewrite in logarithmic form:** (a)  $5^x = 20$

(b)  $2^{-3} = \frac{1}{8}$

**(13) Evaluate:**

(a)  $\log_4 4$

(b)  $\log_5 1$

(c)  $\log \frac{1}{10}$

(d)  $\ln e$

(e)  $\ln 1$

(f)  $\ln \frac{1}{e}$

(g)  $\ln e^2$

**(14) Simplify, if possible:**

(a)  $\ln 8 + \ln 5$

(b)  $\ln 20 + \ln \frac{1}{2}$

(c)  $\ln 12 - \ln 4$

(d)  $\ln 500 - \ln 20$

(e)  $\frac{\ln 15}{\ln 3}$

(f)  $(\ln 2)(\ln 6)$

(g)  $e^{\ln(x+3)}$

(h)  $\ln e^{\sin x}$

(i)  $e^{-2\ln x}$

(15) Rewrite without an exponent:  $\ln x^3$

(16) Rewrite using an exponent:  $-\ln 2$

(17) If you could use a calculator, how would you evaluate the following problems?

(a)  $\log_7 40$                       (b)  $\log_5 0.27$

(18) Are the following expressions defined? Indicate “yes” or “no.”

(a)  $\frac{17}{5+3-8}$

(b)  $\frac{6x}{x+3}, x=0$

(c)  $\frac{x^2}{x-5}, x=5$

(d)  $\sqrt{x-10}, x=14$

(e)  $\sqrt{x+8}, x=-8$

(f)  $\sqrt{x-1}, x=0$

(g)  $\ln 1$

(h)  $\ln 0$

(i)  $\ln(-3)$

(19) Indicate if the following statements are “true” or “false.”

(a) The graph of  $y = \frac{x^2 - 4}{x + 2}$  is equivalent to the graph of  $y = x - 2$ .

(b) The solutions for  $3x^3 = 14x^2$  are the same as those for  $3x = 14$ .

(c) The graph of  $y = \sqrt{x^2}$  is equivalent to the graph of  $y = x$ .

(20) Given that  $f(x) = x^2 + 3x$  and  $g(x) = \sin x$ , determine:

(a)  $f(7)$                       (b)  $g(\pi)$                       (c)  $f\left(g\left(\frac{3\pi}{2}\right)\right)$                       (d)  $f(g(x))$

(e)  $g(f(x))$                       (f)  $f(f(x))$                       (g)  $f(x+c)$                       (h)  $h(1)$  where  $h(x) = f^2(x+1)$

(i)  $j(\pi)$  where  $j(x) = \sqrt{f(g(x)+2)}$