AP Calculus Summer Assignment Name _____

Due: First day of class

Complete the following exercises **without a calculator**, unless specified otherwise. Show work to justify and support your answers. Put a box around your final answer.

Part 1: Lines and Linear Functions

Objectives:

(1) Find the slope of a line.

(2) Write the equation of a line using the point-slope equation and/or the slope-intercept equation.

(3) Graph a line, given its equation or information about the line.

(4) Write the equation of a line parallel or perpendicular to a given line.

1. Write the equation of the line that meets the following conditions. Use point-slope form.

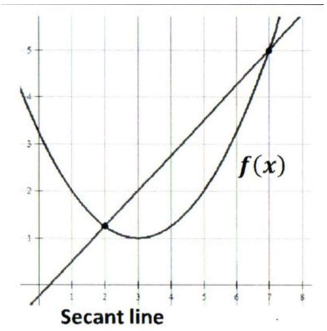
   A. slope = 3 and $(4, -2)$

   B. $m = -\frac{3}{2}$ and $f(-5) = 7$

   C. $f(4) = -8$ and $f(-3) = 12$

MULTIPLE CHOICE

2. Which choice represents the slope of the secant line shown?



   A. $\frac{7-2}{f(7)-f(2)}$

   B. $\frac{f(7)-2}{7-f(2)}$

   C. $\frac{7-f(2)}{f(7)-2}$

   D. $\frac{f(7)-f(2)}{7-2}$

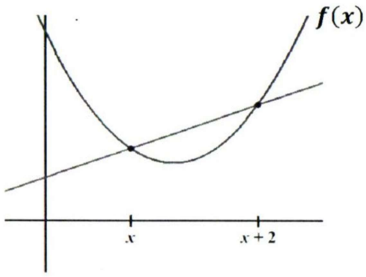
3. Which choice represents the slope of the secant line shown?

A. $\frac{f(x)-f(x+2)}{x+2-x}$

B. $\frac{f(x+2)-f(x)}{x+2-x}$

C. $\frac{f(x+2)-f(x)}{x-(x+2)}$

D. $\frac{x+2-x}{f(x)-f(x+2)}$



Secant line

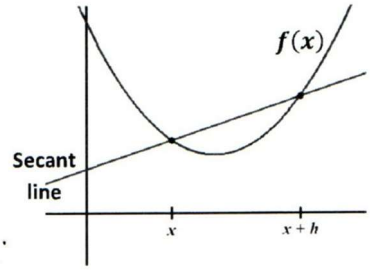
4. Which choice represents the slope of the secant line shown?

A. $\frac{f(x+h)-f(x)}{x-(x+h)}$

B. $\frac{x-(x+h)}{f(x+h)-f(x)}$

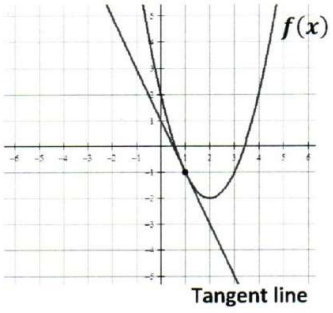
C. $\frac{f(x+h)-f(x)}{x+h-x}$

D. $\frac{f(x)-f(x+h)}{x+h-x}$

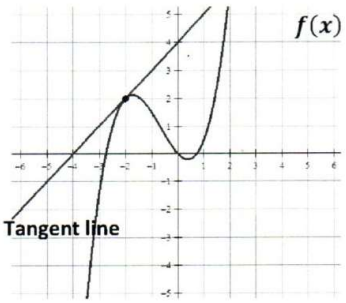


5. Write the equation of the tangent line in the point-slope form.

A. The line tangent to $f(x)$ at $x = 1$



B. The line tangent to $f(x)$ at $x = -2$



Part 2: Functions and Graphs

Objectives:

(1) Evaluate a function, given its rule or its graph.

(2) Identify the domain and range of a function.

(3) Determine the sum, difference, product, quotient, or composition of two functions.

(4) Determine the inverse of a function.

6. Given $f(x) = x^2 - 2x + 5$, find the following.

A. $f(-2)$ B. $f(x+2)$ C. $f(x+h)$

7. For each function, determine its domain and range. [Hint: Graph the function.]

Function	Domain	Range

A. $y = \sqrt{x-4}$

B. $y = (x-3)^2$

C. $y = \ln x$

D. $y = e^x$

E. $y = \sqrt{4-x^2}$

8. If $f(x) = \{(3,5),(2,4),(1,7)\}$ $g(x) = \sqrt{x-3}$
$h(x) = \{(3,2),(4,3),(1,6)\}$ $k(x) = x^2 + 5$, then determine each of the following.

A. $(f+h)(1)$ B. $(k-g)(5)$ C. $(f \cdot h)(3)$

D. $\left(\frac{h}{f}\right)(3)$ E. $g(k(7))$ F. $g(g(12))$

G. $g(f(2))$ H. $k(g(x))$

I. $f^{-1}(4)$ J. $g^{-1}(x)$

Part 3: Transformations of Functions

Objectives:

(1) Graph basic functions (without use of technology), including identity, square, cube, square root, absolute value, and rational function.

(2) Describe transformations of graphs in the plane, including vertical shifts, horizontal shifts, vertical stretches/shrinks, and reflections.

(3) Use transformations to sketch graphs of functions.

9. Identify the transformation that would be used to sketch the graph, given the graph of the parent function.

A. Parent function: $y = x^2$ $y = (x-10)^2$

B. Parent function: $y = |x|$ $y = |x| - 5$

C. Parent function: $y = \sqrt{x}$ $y = -\sqrt{x} + 2$

D. Parent function: $y = \frac{1}{x}$ $y = \frac{1}{x+3}$

For each set below, complete the following on a sheet of graph paper. Sketch a graph of the parent function without using technology. Then draw a quick sketch of each additional equation in the family. Identify the transformation(s) involved. Check your sketches with a graphing calculator.

10. Parent function: $y = x^2$

A. $y = x^2 - 5$

B. $y = (x + 8)^2$

C. $y = 4x^2$

D. $y = 0.25x^2$

E. $y = -x^2$

F. $y = -(x + 3)^2 + 6$

G. $y = (x + 4)^2 - 8$

H. $y = -2(x + 1)^2 + 4$

11. Parent function: $y = x^3$

A. $y = x^3 + 2$

B. $y = -x^3$

C. $y = (x - 3)^3$

D. $y = (x - 1)^3 - 4$

E. $y = -x^3 + 3$

F. $y = -2(x + 2)^3 + 1$

12. Parent function: $y = \sqrt{x}$

A. $y = \sqrt{x} - 2$

B. $y = \sqrt{-x}$

C. $y = \sqrt{x + 2}$

D. $y = -\sqrt{4 - x}$

13. Parent function: $y = |x|$

A. $y = |x - 3|$

B. $y = |3x|$

C. $y = 3 - |x|$

D. $y = 2|x| - 1$

14. Parent function: $y = \frac{1}{x}$

A. $y = \frac{1}{x-4}$

B. $y = -\frac{1}{x+1}$

Part 4: Exponential and Logarithmic Functions

Objectives:

(1) Simplify expressions involving exponential and/or logarithmic expressions.

(2) Solve exponential and logarithmic equations.

(3) Graph exponential and logarithmic functions, including those with transformations.

15. Simplify the following expressions.

A. $\left(5a^{2/3}\right)\left(4a^{3/2}\right)$ B. $\frac{4xy^{-2}}{12^{\ -3}y^{-5}}$ C. $\left(4a^{5/3}\right)^{3/2}$

D. $\frac{\sqrt{x}}{x}$ E. $e^{\ln x}$ F. $e^{1+\ln x}$

G. $\ln 1$ H. $\ln e^{7}$ I. $\log_3 \frac{1}{3}$

J. $\log_{1/2} 8$ K. $\ln \frac{1}{2}$ L. $27^{2/3}$

16. Solve the following equations.

A. $e^{x}+1=2$ B. $3e^{x}+5=8$ C. $e^{2x}=1$

D. $\ln x=0$ E. $3-\ln x=3$ F. $\ln(3x)=0$

G. $x^{2}-3x=0$ H. $e^{x}+xe^{x}=0$ I. $e^{2x}-e^{x}=0$

For each set below, complete the following on a sheet of graph paper. Sketch a graph of the parent function without using technology. Then draw a quick sketch of each additional equation in the family. Identify the transformation(s) involved. Check your sketches with a graphing calculator.

17. Parent function: $y = e^x$

A. $y = e^{2x}$ B. $y = e^{2x} - 1$

C. $y = -e^x$ D. $y = e^{-x}$

E. $y = e^{x-2}$ F. $y = e^{2-x}$

18. Parent function: $y = \ln x$

A. $y = \ln(x + 3)$ B. $y = \ln(x) + 3$

C. $y = -\ln(x - 2)$ D. $y = \ln(-x)$

Part 5: Trigonometric Functions

Objectives:

(1) Evaluate trigonometric functions using unit circle and/or special triangles.

(2) Solve trigonometric equations.

(3) Graph basic trigonometric functions, including those with transformations.

19. Use the unit circle or special triangles to evaluate the following expressions. Give exact answers (not decimals).

A. $\sin\frac{\pi}{6}$ B. $\cos\frac{\pi}{4}$ C. $\sin 2\pi$

D. $\tan\pi$ E. $\sec\frac{\pi}{2}$ F. $\cos\frac{\pi}{6}$

G. $\sin\frac{\pi}{3}$ H. $\sin\frac{3\pi}{2}$ I. $\tan\frac{\pi}{4}$

J. $\csc\frac{\pi}{2}$ K. $\sin\pi$ L. $\cos\frac{\pi}{3}$

20. Solve the following trigonometric equations where $0 \leq x \leq 2\pi$. Give answers in radians.

A. $\sin x = \frac{1}{2}$

B. $\cos x = -1$

C. $\cos x = \frac{\sqrt{3}}{2}$

D. $2\sin x = -1$

E. $\cos x = \frac{\sqrt{2}}{2}$

F. $\cos\left(\frac{x}{2}\right) = \frac{\sqrt{3}}{2}$

G. $\tan x = 0$

H. $\sin(2x) = 1$

I. $\sin\left(\frac{x}{4}\right) = \frac{\sqrt{3}}{2}$

For each set below, complete the following on a sheet of graph paper. Sketch a graph of the parent function without using technology. Then draw a quick sketch of each additional equation in the family. Identify the transformation(s) involved. Check your sketches with a graphing calculator.

21. Parent function: $y = \sin x$

A. $y = \sin(2x)$

B. $y = \sin x + 2$

C. $y = 2\sin x$

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

22. Parent function: $y = \cos x$

A. $y = \cos\frac{x}{2}$

B. $y = 2\cos x - 1$