AP Calculus Homework Five – Applications of Differential Calculus

3.1 Slope, Critical Points, Tangents and Normals; 3.2 Increasing and Decreasing Functions;
3.3 Maximum, Minimum, and Inflection Points

1. Find the slope of the curve $y^2 - xy - 3x = 1$ at the point (0, −1).

2. Find the equation of tangent to the curve $y = x \sin x$ at the point (π/2, π/2).

3. Find the value of *x* so that the tangent to the curve $y = xe^{-x}$ is horizontal.

4. What is the value of *y* for which the tangent to the curve $y^2 - xy + 9 = 0$ is vertical?

5. Find the local extrema and the inflection points of the function $y = x^4 - 4x^2$

6. What is the maximum value of the function $y = -4\sqrt{2-x}$?

7. Find the total number of local maximum and minimum points of the function whose derivative, for all x, is given by $f'(x) = x(x-3)^2(x+1)^4$.

.

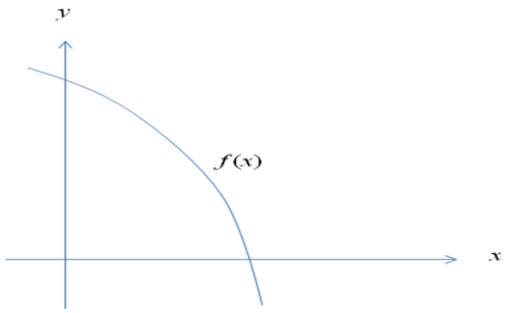
8. Find local minimum value(s) of the function $y = \frac{e^x}{x}$.

9. If $f(x) = xe^{-x}$, then at $x = 0$

   (A) f is increasing. (B) f is decreasing.
   (C) f has a relative maximum. (D) f has a relative minimum.
   (E) f' does not exist.

10. Find the equation of the tangent to the curve with parametric equations $x = 2t + 1$ and $y = 3 - t^3$ at the point where $t = 1$.

11. If $f(x) = cx^2 + dx + e$ for the function shown in the graph, then



(A) c, d, and e are all positive.
(B) $c > 0$, $d < 0$, $e < 0$.
(C) $c > 0$, $d < 0$, $e > 0$.
(D) $c < 0$, $d > 0$, $e > 0$.
(E) $c < 0$, $d < 0$, $e > 0$.

12. Find the point on the curve $y = \sqrt{2x+1}$ at which the normal is parallel to the line $y = -3x + 6$.

13. Find the value of k such that the line $y = 3x + k$ is tangent to the curve $y = x^3$.

For Questions 14 and 15, $f'(x) = x \sin x - \cos x$ for $0 < x < 4$.

14. Find the value of x for which f has a local maximum.

15. Find the value of x for which the graph of f has a point of inflection.