

Math 191 Sec F0501/F0502
Practice Problems for Test 3

1. Over what intervals is $f(x) = x^2 \ln x$ increasing? (Begin by determining the domain of $f(x)$).

ans: $(-\infty, 2/1-e)$

2. Let $f(x) = e^{\sqrt{2+g(x)}}$ where $g(x)$ is a function with $g(6) = 7$ and $g'(6) = 12$. Find $f'(6)$, and report your answer to 3 significant digits. Solve this problem without assuming that $g(x)$ is a linear function.

ans: 2.707×10^2

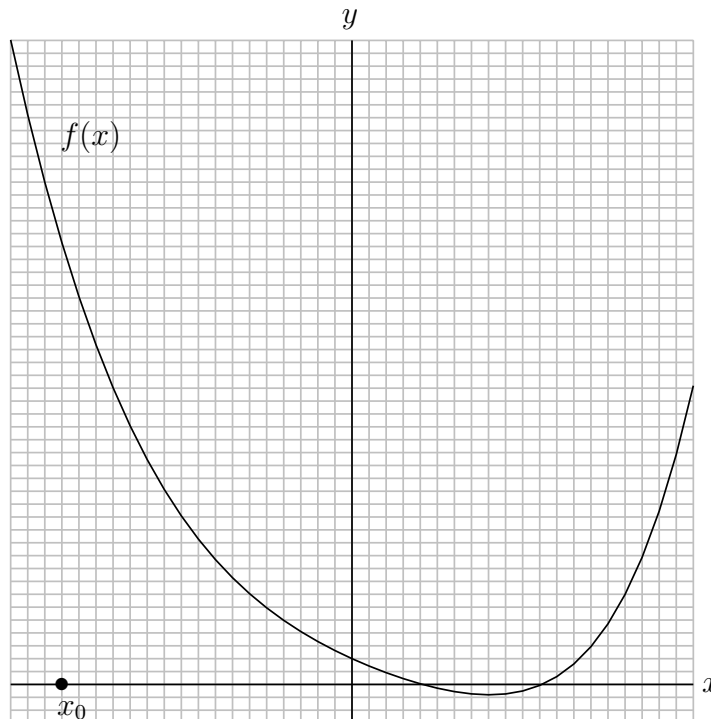
3. Suppose time t is measured in seconds, $v = v(t)$ is the velocity of a bicycle at time t in m/sec, and $a = a(t)$ is the acceleration of the bicycle at time t in m/sec^2 . If $v(50) = 2$ m/s and $a(50) = 0.05$ m/sec^2 , then estimate $v(53)$.

ans: 2.15 m/s

4. The rate of change of $f(x) = (x - 1)e^{-3x}$ has a single relative extremum. Find it.

ans: relative minimum of f at $x = 5/9$

5. Suppose we wish to use Newton's Method to find the left hand zero of the function below. Beginning with the initial estimate for x_0 as indicated, use a ruler to estimate the position of x_2 .



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6. Newton's method is to be used to locate a critical value of $f(x) = -\frac{x^2}{2} + x + \cos x$. Using the initial estimate $x_0 = 1$, find x_1 and report your answer to three significant digits.

ans: 1.457

7. Find the equation of the tangent line to the curve $x^2y^2 = (y+1)^2(4-y^2)$ at the point $(0, -2)$.

ans: $z = -6$

8. Consider the curve

$$\frac{x}{y} + \left(\frac{y}{x}\right)^3 = 2.$$

Given that $(-1, -1)$ is a point on the curve, use a tangent line approximation to estimate y when $x = -0.9$.

ans: $y \approx -0.6$

9. Find the equation of the tangent line to the curve

$$\ln(xy) = 2x$$

at the point $(1, e^2)$.

ans: $xe^2 = 2$

10. Let $f(x) = \sqrt{1+x^3}$. Using a tangent line approximation at $x = 2$, estimate the value of x for which $f(x) = 3.3$.

ans: $x \approx 2.17$

11. For the function $f(x) = x^2e^{-x^2}$ find the x -coordinate of critical values, intervals of increase/decrease, and any relative extrema.

ans: critical values at $x = 0, 1, -1$; increasing: $(-\infty, -1), (0, 1)$; decreasing: $(-1, 0), (1, \infty)$; rel. max. at $x = -1, 1$; rel. min. at $x = 0$

12. Find the x -coordinate of the inflection points of

$$f(x) = 3x^5 - 20x^4.$$

ans: $x = 4$

13. If point elasticity of demand is -2.3 and price increases by 3% , what is the approximate percentage change in demand?

ans: -6.9%

14. Given the demand equation $p = 300 - q^2$, find point elasticity of demand when $q = 5$. For what value of q is demand unit elastic?

ans: $q = 10$
