

Math 10350 Fall 07 – Final Review

1. Find all horizontal and vertical asymptotes of the graph of $g(x) = \frac{x^2}{x^2 - 1}$. Determine also (a) the values of x for which $f'(x)$ is decreasing, and (b) the values of x for which $f''(x)$ is increasing.

2. Use Newton's method to find an approximation to $\sqrt[7]{100}$.

3. In a certain city the temperature (in $^{\circ}F$) t hours after 9a.m. was approximated by the function

$$T(t) = 50 + 14 \sin \frac{\pi t}{12}.$$

Find the average temperature during the period from 9a.m. to 9p.m.

4. A particle is moving on a straight line according to the velocity function:

$$v(t) = t(t - 2)(t - 4).$$

Find (a) the displacement and (b) the distance travelled by the particle in the time interval $1 \leq t \leq 6$.

5. Evaluate the following integrals

a. $\int \frac{x^2}{(x - 1)^{20}} dx$

d. $\int_0^{\pi/6} \sin^2 u \cos u du$

6. (Review) Gravel is being dumped from a conveyor belt at the rate of $40\pi \text{ ft}^3/\text{min}$ and its coarseness is such that it forms a pile in the shape of a cone whose height is always twice its diameter at the base. How fast is the height of the pile increasing when the pile is 5 feet high? (Answer: $25.6 \text{ ft}/\text{min}$)

7. Let $F(x) = \int_{\sqrt{x}}^3 \frac{\cos t}{t} dt$. Find $F'(x)$.

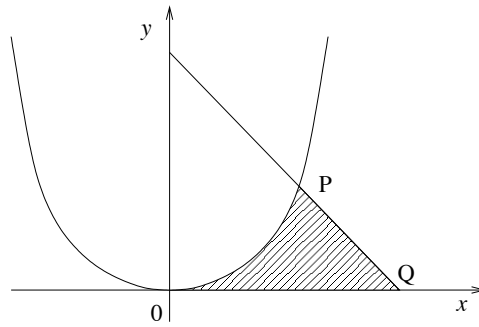
8. Using limits find the derivative of $f(x) = \sqrt{x + 1}$. Write down the linear approximation to $f(x)$ at $x = 3$. Estimate $\sqrt{3.8}$. Draw a graph to illustrate your estimation.

9. Two submarines at 1000 ft below sea level are travelling at 520 mph along straight-line courses that cross at right angles. How fast is the distance between the submarines closing when submarine A is 5 mi from the intersection point and submarine B is 12 mi from the intersection point.

10. The cross-section of a tunnel is a rectangle of height h meters surmounted by a semicircular roof section of radius r meters. If the cross-sectional area is 100 m^2 , determine the dimensions of the cross-section which minimize the perimeter.

11. If $-4 \cos(y) + 3xy^2 = x^7$ find $\frac{dy}{dx}$.

12. The figure shows the curve $y = x^2$ and the straight line $2x + y = 15$. Find (i) the coordinates of P and Q and (ii) the area of the shaded region.



13. The figure shows part of the curve $y = x^2$. PQ is the tangent to this curve at P . Find the area of the shaded region.

