Sample Exam 4 Solutions

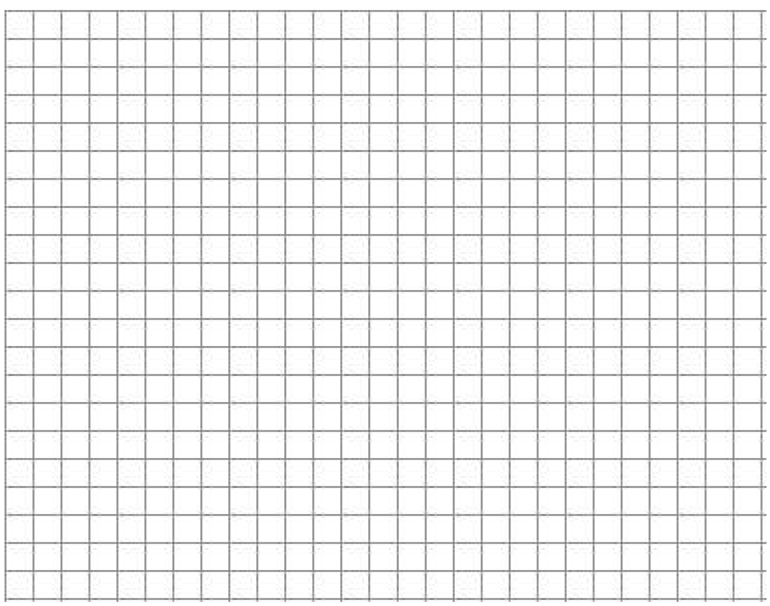
NAME: DATE:

1. Using linearization $f(x)$ is approximately 3.003704 whereas the actual value is 3.003699. So the estimate is an overestimate.

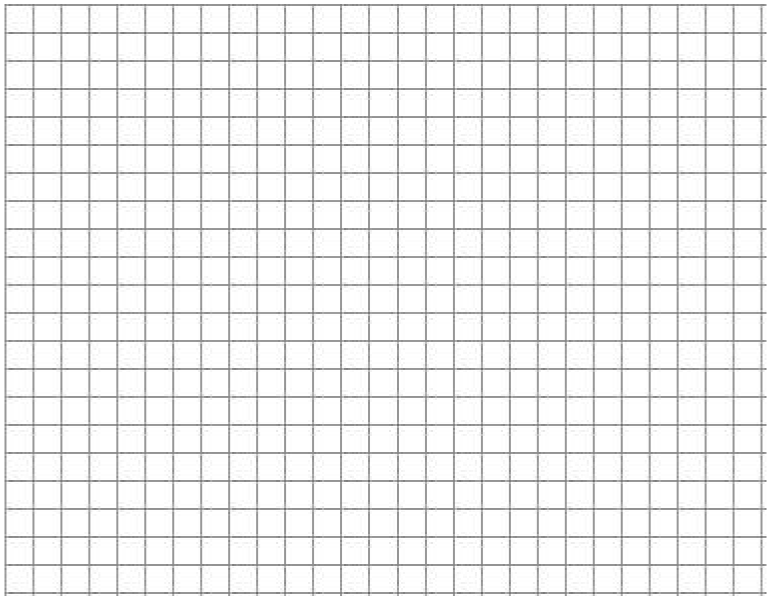
2. (a) minimum of $f(x) = -\dfrac{9}{8}$ occurs at $x = \dfrac{1}{8}$, maximum of $f(x) = 9$ occurs at $x = -1$

   (b) minimum of $f(x) = -1$ occurs at $x = 0$, maximum of $f(x) = 27$ occurs at $x = 4$

3. (a) increasing on the interval $\left(-\dfrac{3}{2}, +\infty\right)$, decreasing on the interval $\left(-\infty, -\dfrac{3}{2}\right)$, local min at the point $\left(-\dfrac{3}{2}, -\dfrac{43}{16}\right)$, inflection points at $(-1,-2)$ and $(0,-1)$, concave up on the intervals $(-\infty,-1)$ and $(0,+\infty)$ and concave down on the interval $(-1,0)$, x-intercepts at $x = -2.1$ and $x = .72$ and no asymptotes



   (b) decreasing for all $x \neq 2$, no local min or max, concave down on the interval $(-\infty, 2)$ and concave up on the interval $(2, +\infty)$, no inflection points, vertical asymptote at $x = 2$, horizontal asymptote at $y = 1$ and intercepts at $(-3, 0)$ and $(0, -3/2)$



4. (a) $\frac{1}{2}$

   (b) 0

   (c) π, solution is correct, here is the clarification:

$$\lim_{x\to\infty} x \cdot \sin\left(\frac{\pi}{x}\right) = \lim_{x\to\infty} \frac{\sin\left(\frac{\pi}{x}\right)}{\frac{1}{x}}$$

   which is an indeterminate form of type $\frac{0}{0}$. Apply L'Hopital one time only to get:

$$\lim_{x\to\infty} \frac{-\pi x^{-2}\cos\left(\frac{\pi}{x}\right)}{-x^{-2}}$$

$$= \lim_{x\to\infty} \pi\cos\left(\frac{\pi}{x}\right) = \pi$$

   (d) 0

   (e) 0

   (f) ∞

   (g) $\frac{1}{3}$