

Please read directions carefully. Raise your hand if you are not sure what a problem is asking. You must explain your work thoroughly and unambiguously to receive full credit on questions or parts of questions designated as **Work and Answer**.

No calculators or notes are allowed on this quiz.

Multiple Choice. (8 points) Circle the letter of the best answer.

1. The linear approximation of the function $g(x) = x^{11} - x + 2$ at $x = 1$ is

(a) $y = -10x + 6$

(c) $y = 12x + 10$

(b) $y = 10x - 8$

(d) $y = -12x + 6$

2. The linear approximation of the function $f(x) = \sqrt[4]{x}$ at $x = 2$ is $y = \frac{1}{32}x + \frac{3}{2}$. Using this (or differentials), $\sqrt[4]{15}$ is approximately

(a) $\frac{65}{32}$

(c) $\frac{62}{32}$

(b) $\frac{63}{32}$

(d) $\frac{61}{32}$

Fill-In. (4 points) If $f(x) = \ln x$, $x = 4$, and $dx = 0.1$, then $dy =$ _____
(number)

Work and Answer. (8 points) You must show all relevant work to receive full credit. You may use the back if you need more room.

The volume of a cone with height 60 meters and radius r is

$$V(r) = 20\pi r^2.$$

A cone-shaped water tank of radius 10 meters and height 60 meters is to be painted with a sealant of uniform thickness that will increase the top radius by 0.1 cm (= 0.001 m). Use differentials to estimate the volume of sealant required. Be sure to give units on your answer, e.g. yards, months, etc.

