

Answers to Additional Problems Unit Three

1. a) $f[g(x)] = f[x^2 + 4] = \sqrt{x^2 + 4 - 4} = \sqrt{x^2} = x$ since $x \geq 0$.
 $g[f(x)] = g[\sqrt{x-4}] = (\sqrt{x-4})^2 + 4 = x - 4 + 4 = x$

b) The graphs of $f(x)$ and $g(x)$ fall in the first quadrant.
 $f(x)$ passes through (4,0), (5,1), and (8,2).
 $g(x)$ passes through (0,4), (1,5), and (2,8).

c) Show that $f'(x) > 0$ and $g'(x) > 0$.

$$f'(x) = \frac{1}{2\sqrt{x-4}} \text{ which is greater than 0 if } x > 4.$$

$$g'(x) = 2x \text{ which is greater than 0 if } x \geq 0.$$

2. b

3. $g(x) = \frac{x^3 + 2}{5}$

4. Domain of $g(x)$ is $x \geq 0$. Range of $g(x)$ is $y \geq 2$. Point is (8,5).

5. $\frac{1}{3} \ln x - 2 \ln y$

6. -0.1863

7. a) $x = \sqrt[5]{2} = 1.1487$

b) $x = 0.3498$

8. a) $\ln x$ b) $\frac{3(\ln x)^2}{x}$ c) $\frac{-2}{\sqrt{1-4x^2}}$

d) $\frac{1}{\sqrt{x}(1+x)}$ e) $-2e^{5-2x}$ f) $\frac{2}{x \ln 10}$

g) $5e^{2x} \cos 5x + 2e^{2x} \sin 5x$ h) $x^2 + 3x^2 \ln(2x)$

9. $5e^{5x} + 5e^{5x}y^2 - 3x^2 - 3x^2y^2$

10. $\sqrt[3]{\frac{x+1}{x-1}} \left[\frac{1}{3(x+1)} - \frac{1}{3(x-1)} \right]$

11. a) $\frac{2\pi}{3}$

b) $\frac{\pi}{9}$

c) $\frac{5}{13}$

12. a) $\frac{1}{4}$

b) $\frac{5}{7}$

c) 1

d) e^6