4. Given that $g(x) = \arctan(\frac{1}{x})$, evaluate $\lim\limits_{h \to 0} \dfrac{g(2+h) - g(2)}{h}$

(a) 4/5   (b) 1/2   (c) $-1/5$ (d) $\frac{\ln(2)}{2}$

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5. The line tangent to $h(x) = x^3 - 5x^2 - x + 3$ at the point $(1, -2)$ has an x–intercept of

(a) 0   (b) 0.75   (c) 3   (d) 6

9. The smallest possible value of x where $f(x) = \frac{x}{x^2 + a}$ has an inflection point is

(a) $\sqrt{a}$ (b) $\sqrt{2a}$ (c) $\sqrt{3a}$ (d) $a\sqrt{2}$

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10. Which of the following is incorrect?

(a) $\frac{d}{dx}(2^x) = 2^x \ln(2)$ (b) $\frac{d}{dx}(\log_4(x)) = \frac{1}{x \ln(4)}$

(c) $\frac{d}{dx}(x^x) = x^x[1 + \ln(x)]$ (d) $\frac{d}{dx}(a^{u(x)}) = a^{u(x)} \ln(a)$

14. For what value(s) of a does $f(x) = x^3 + ax^2 + bx + 2$ have a local maximum at

$x = -3$ and a local minimum at $x = -1$?

(a) 6   (b) 9   (c) both 6 and 9

(d) there are no such values

30. Let $f(x) = \dfrac{c}{x} + x^2$ Determine all values of c for which $f(x)$ has a relative minimum, but no relative maximum.

(a) $c > \sqrt[3]{2}$ (b) $|c| > \sqrt[3]{2}$ (c) all values of c

(d) there are no such values of c

16. What is the area of the largest rectangle that has its base on the x-axis and its other two vertices on the parabola $y = 8 - x^2$?

(a) $\frac{32\sqrt{6}}{9}$ (b) $\frac{2\sqrt{6}}{3}$ (c) $\frac{8}{9}$ (d) $\frac{64\sqrt{6}}{9}$

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17. Which integral does the following limit represent?

$$\lim_{n \to \infty} \sum_{i=1}^{\infty} \frac{\pi}{4n} \sin \frac{\pi n + \pi i}{4n}$$

(a) $\int_0^{\frac{\pi}{2}} \sin(x + \frac{\pi}{4}) dx$ (b) $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \sin(x) dx$ (c) $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \sin(x + \frac{\pi}{4}) dx$

(d) $\int_0^{\frac{\pi}{4}} \sin(x) dx$

35. Differentiate $f(x) = x^{\sqrt{x}}$

(a) $(\sqrt{x}) x^{\sqrt{x}-1}$ (b) $x^{\frac{3}{2}\sqrt{x}}$ (c) $\frac{\sqrt{x}}{x} + \frac{\ln(x)}{2\sqrt{x}}$ (d) $x^{\sqrt{x}} \frac{2+\ln(x)}{2\sqrt{x}}$

44. Find the derivative of

$$\frac{\sqrt{x} - 1}{\sqrt{x} + 1}$$

(a) $\frac{1}{x\sqrt{x} + 2x + \sqrt{x}}$ (b) 1 (c) $\frac{4}{\sqrt{x}}$ (d) $\frac{\sqrt{x}-1}{2\sqrt{x}+4x+1}$