Math Aptitude Test #2

Notes:

1. **This exam consists of two parts, each part contains 10 questions. You have to show your answers properly. Partial credits are considered for steps.**
2. **Scientific Calculators are not allowed, only basic ones.**

Part (I): consists of ten questions – show your logical steps

1. **The solution for the equation $\sqrt{x+1}-3\sqrt{x}=2\sqrt{x}$ is**

   a. $x=1/14$
   b. $x=1/24$
   c. $x=-1/24$
   d. $x=-1/14$

2. **The real roots for the equation $\sqrt{2}\,x^2+2x+\frac{1}{\sqrt{2}}=0$ is**

   a. $\frac{1}{\sqrt{2}}, repeated$
   b. $-\frac{1}{\sqrt{2}}, repeated$
   c. $-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}$
   d. Φ

3. **If $f(x)=x^2+1$, then $\frac{f(x+h)-f(x)}{h}$ is**

   a. $2x+h$
   b. $2x-h$
   c. $x+2h$
   d. $x-2h$

4. **Simplify $\left(\frac{x^{-3}}{y^2z^{-2}}\right)^{-3}=$**

   a. $\frac{yz^5}{x^6}$
   b. $\frac{x^6}{yz^5}$
   c. $\frac{x^9z^2}{y^2}$
   d. $\frac{x^9y^6}{z^6}$

5. The value of x that satisfies the equation $\log_x\left(6-4x-x^2\right)=2$ is

a. $x=-3, x=1$
b. Only $x=1$
c. Only $x=-3$
d. Φ $\left(No\,solution\right)$

6. The value of $\log 10,000-6\log\sqrt{10}=$

a. 0
b. 1
c. 4
d. $\dfrac{10,000}{6\sqrt{10}}$

7. The equation of the line that passes through the point $p(0,0)$ and is perpendicular to the line $y=-4x+5$ is

a. $y=-\dfrac{1}{5}x$
b. $y=\dfrac{1}{4}x$
c. $y=-5x$
d. $y=4x$

8. Let $f(x)=x^3-4x^2+4x-16$, define $\forall x\in\Re$. Then the linear product terms for $f(x)$ is

a. $(x-4)(x+2)^2$
b. $(x-4)^2(x-2i)$
c. $(x-4)(x-2)^2$
d. $(x-4)(x+2i)(x-2i)$

9. The real zeros (if any) of the rational function $g(x)=3+\dfrac{4}{x^2+3}$, define $\forall x\in\Re$ are

a. $x=-\sqrt{3}, x=\sqrt{3}$
b. $x=-\dfrac{4}{3}, x=\dfrac{4}{3}$
c. Only $x=-4$
d. No real zeros

10. **Let the function $f(x)$ be defined by the equation $y = f(x)$, where x and $f(x)$ are real numbers. The domain of $f(x) = \sqrt{16x^2 - 2}$ is**

a. $\left(-\infty, -\frac{1}{8}\right) \cup \left(\frac{1}{8}, \infty\right)$

b. $\left(-\infty, -\frac{\sqrt{2}}{4}\right) \cup \left(\frac{\sqrt{2}}{4}, \infty\right)$

c. $\left(-\infty, -\frac{1}{8}\right] \cup \left[\frac{1}{8}, \infty\right)$

d. $\left(-\infty, -\frac{\sqrt{2}}{4}\right] \cup \left[\frac{\sqrt{2}}{4}, \infty\right)$

Part (II): consists of ten questions – show your logical steps

1. **The exact value of $\cos(60^\circ + 135^\circ) =$**

a. $\frac{1+\sqrt{3}}{2\sqrt{2}}$

b. $\frac{1-\sqrt{3}}{2\sqrt{2}}$

c. $\frac{-1+\sqrt{3}}{2\sqrt{2}}$

d. $\frac{-1-\sqrt{3}}{2\sqrt{2}}$

2. **The angle ϕ (degrees) that satisfies $\csc(\phi) = 2$, $\phi \in [0, 2\pi]$ is**

a. 60°, 240°

b. 30°, 150°

c. 30°, 210°

d. 45°, 225°

3. **Given $\sec(\theta) = \sqrt{10}$ and $\tan(\theta) = 3$. Then $\csc(90^\circ - \theta) =$**

a. $\sqrt{10}$

b. $\sqrt{10}/3$

c. $1/\sqrt{10}$

d. $3/\sqrt{10}$

4. The solution of $\ln(x)-\ln(x-1)=\ln\left(\sqrt{e^{-1}}\right)$ **is**

a. $x=1/3$

b. $x=1$

c. $x=1/2$

d. Φ

5. If $y=5^{\sqrt{x}}+\left(\sqrt{x}\right)^{5}$ **,then** $\frac{dy}{dx}(x=4)$ **is**

a. $\frac{25}{4}\ln(5)+20$

b. $\frac{25}{4}\ln(5)-20$

c. $\frac{25}{4}+80$

d. $\frac{25}{4}\ln(5)+40$

6. Use partial fraction method to compute $\int\frac{5x-1}{x^2-25}\,dx$

a. $\frac{1}{5}\ln\left|\left(\frac{x+5}{x-5}\right)^{12}(x+5)\right|+C$

b. $\frac{1}{5}\ln\left|\left(\frac{x-5}{x+5}\right)^{12}\frac{1}{(x+5)}\right|+C$

c. $\frac{1}{5}\ln\left|\left(x^2-25\right)^{12}(x+5)\right|+C$

d. $\frac{1}{5}\ln\left|(x-5)\left(x^2-25\right)^{12}\right|+C$

7. The value of $\lim_{x\to3}\left(\frac{|x-3|}{x-3}\right)=$

a. 1

b. -1

c. $+\infty$

d. Does not exist

8. Use integration by parts to find $\int_{1}^{e}x\ln(x)\,dx=$

a. $\frac{1}{4}\left(e^2+1\right)$

b. $\frac{1}{4}\left(e^2-1\right)$

c. $\frac{1}{2}\left(e^2+\frac{1}{2}\right)$

d. $\frac{1}{4}\left(-e^2+1\right)$

9. Let $y = |\sin(x)|$, then $\frac{dy}{dx} =$

a. $\cos(x)$

b. $\frac{\cos(x)}{|\sin(x)|}, \ \sin(x) \neq 0$

c. $\frac{\sin(x)}{|\sin(x)|}, \ \sin(x) \neq 0$

d. $\frac{\sin(x)\cos(x)}{|\sin(x)|}, \ \sin(x) \neq 0$

10. By using trigonometric identities, the term $\frac{\cos(\alpha)-\cos(\beta)}{\sin(\alpha)+\sin(\beta)} + \frac{\sin(\alpha)-\sin(\beta)}{\cos(\alpha)+\cos(\beta)} =$

a. $\cot(\alpha)-\cot(\beta)+\tan(\alpha)-\tan(\beta)$

b. $\frac{\sin(\alpha/2)-\sin(\beta/2)}{\sin(\alpha/2)+\sin(\beta/2)}$

c. 0

d. 1

Good Luck